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MODERN ELECTRICS

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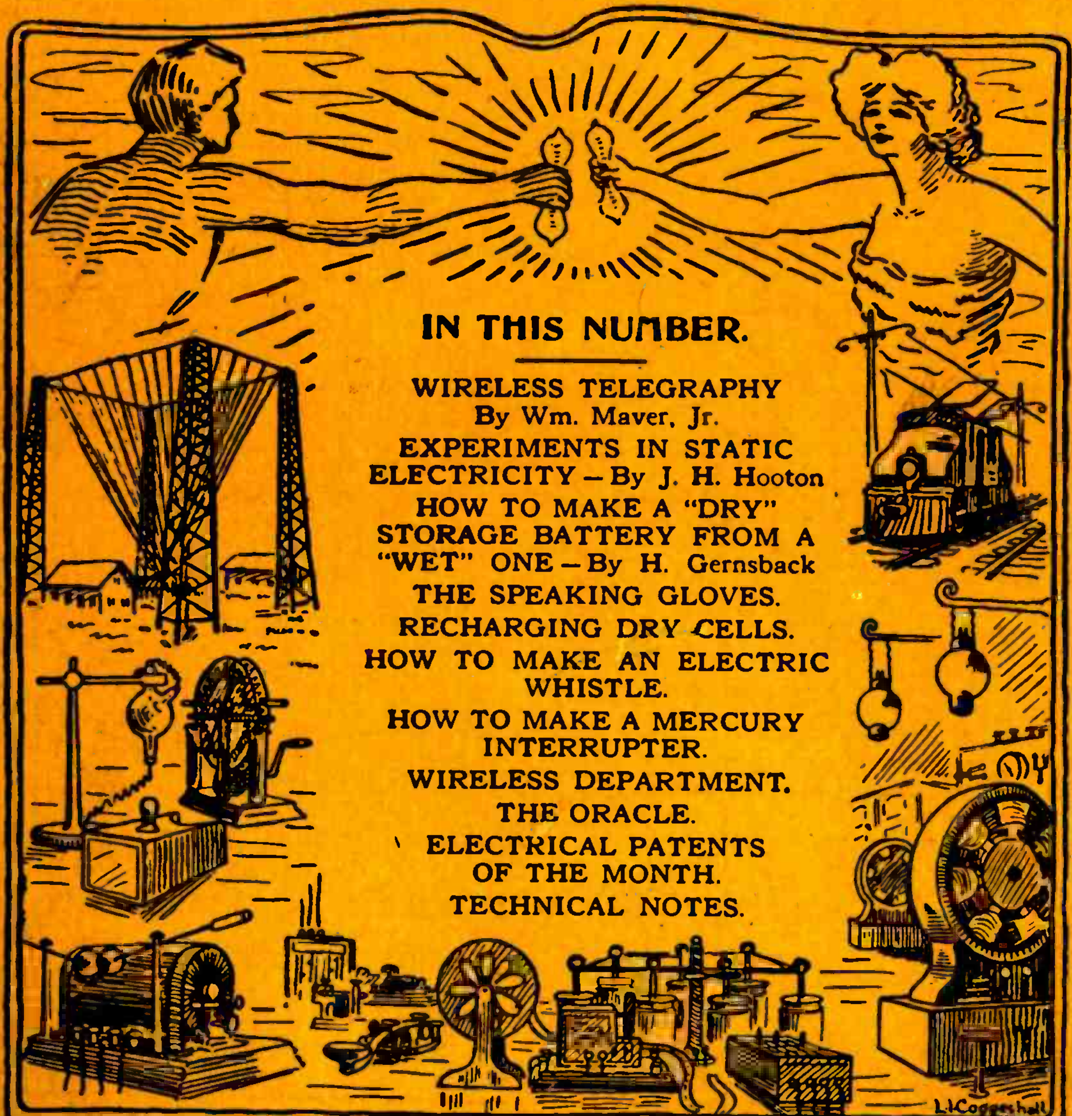

IN THIS NUMBER.

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Accordingly, I thought it fitting to present the members of The Institute of Radio Engineers, **1945 Radio Pioneers Party,** with a miniature copy of MODERN ELECTRICS, in the hope that it might bring back to them a few fond nostalgic radio memories.

Hugo Gernsback

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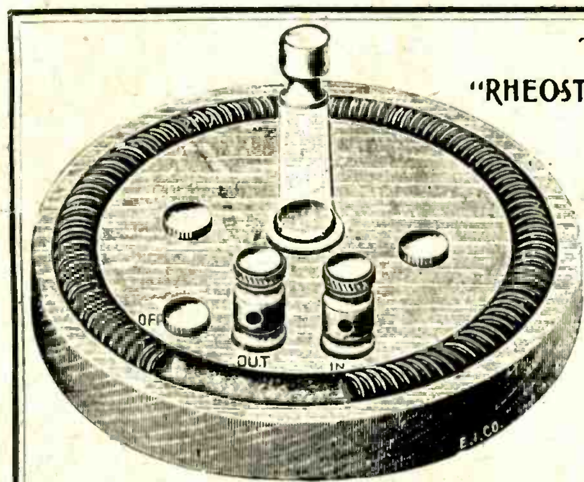

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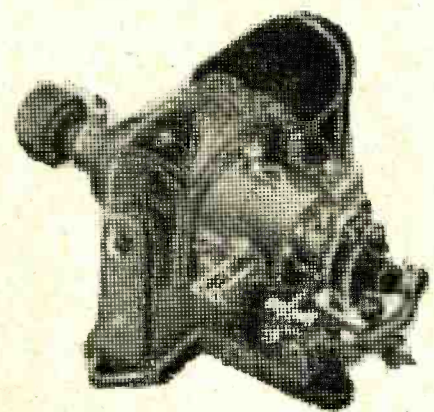

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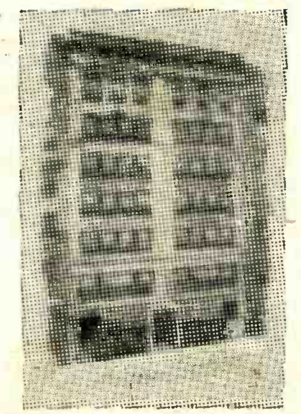

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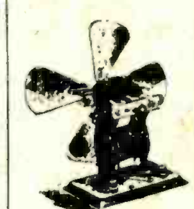

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MODERN ELECTRICS

Vol. I. APRIL, 1908. No. 1.

Wireless Telegraphy.

By William Maver, Jr.

In view of the wide extent to which wireless telegraphy is now employed it is difficult to believe that less than fifteen years ago the art was really not in existence. It is true that in the inner circles of science there were glimmerings of the possibility of such a thing, following the experiments of Hertz, Lodge and others, but amongst laymen had any one at that time seriously predicted the near probability of telegraphing through space without the ubiquitous telegraph wire, he would very likely have been deemed a fit subject for investigation by an alienist. To-day, however, the probability has become a well established reality and there is now no sea or shore where the crunch of the wireless transmitter is not heard.

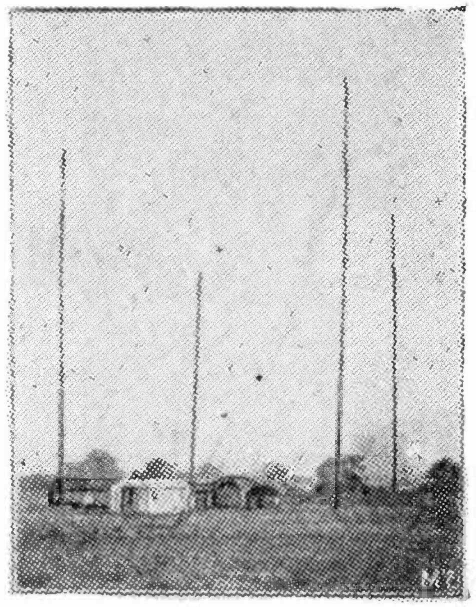


Fig. 1.—Type of Station for Communication up to 500 Miles.

As nearly every one now knows, wireless telegraph signals are sent by means of electric waves that are set up in the ether of free space by means of electric oscillations established in a vertical wire. These electric waves in the ether travel with the speed of light and on arriving at a receiving aerial wire, they strike or cut it and set up in it electric oscillations which affect the wireless coherer or other detector connected with the aerial wire and thereby the transmitted signals are reproduced. To employ a homely analogy it is somewhat as though we should suspend a taut rope in a pond and then by suitable means oscillate the rope. This would agitate the water and the motion thus set up would be propagated from particle to particle of the water. If a light rope should be suspended in the water at a distant point it would tend to oscillate in unison with the waves that had been established by the heavier distant rope, as in the case of the wireless detector.

The ordinary requirements for a commercial or experimental wireless station are the transmitting and receiving apparatus and the vertical wire or antennae at the transmitting and receiving station. The transmitting apparatus consists of a battery and induction coil or an alternating current generator, which originates the electric oscillations that are thrown upon the vertical wire, which wire may vary in length from 4 or 5 feet to 200 feet. The receiving apparatus consists of a detector of electric waves with the receiving vertical wire.

The electric oscillations set up by the transmitter are broken up into short and long trains of oscillations, the equivalents of dots and dashes of the Morse alphabet, by an ordinary Morse telegraph key in the hands of an operator. These dots and dashes are heard by the receiving operator and the signals are recorded in writing by him.

There are a number of wireless telegraph receivers now in use. For instance, the well known filings coherer discovered by M. Branly, the magnetic detector due to Marconi, the electrolytic detector of Fessenden, the Dunwoodie carborundum detector, the De Forest audion and the Pickhard silicon detector. The filings coherer is generally used in connection with a telegraph relay, which it operates, and a record of the message may be obtained by the use of this Morse relay. The magnetic and the electrolytic detectors and the audion require a telephone receiver in their operation; these detectors not being capable of operating the Morse relay.

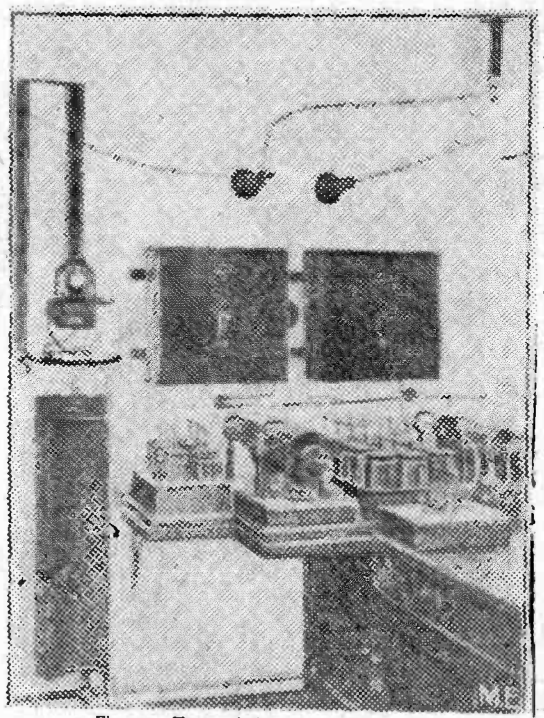


Fig. 2.—Transmitting Apparatus as Used on Atlantic Liners.

There are now, it is estimated, about 1,200 wireless stations in actual operation in all parts of the world, a large majority of which are, as might be expected, on ship board and lighthouses. In fact, approximately 675 vessels of various navies of the world are now equipped with wireless outfits, and about 170 merchant vessels; and 150 lighthouses are likewise thus equipped. Besides these installations, there are nearly 200 commercial wireless land stations and over 60 portable outfits for military purposes. In addition to these stations there are a surprisingly large number of wireless stations—estimated at about

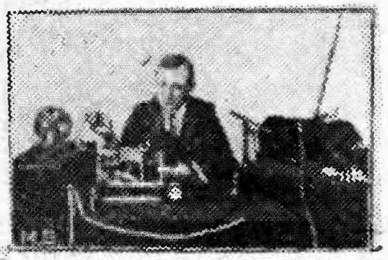


Fig. 3.—Mr Marconi Receiving a Message.

300—that are maintained exclusively for experimental purposes, to say nothing of the numberless wireless equipments installed by amateurs for their own amusement and instruction.

The accompanying illustrations will show the general style of apparatus and the vertical wires employed in wireless telegraphy. Fig. 1 depicts the Chelmsford Station of the Marconi Company, England. Here four vertical masts sustaining the vertical wires are employed. This station is equipped for signaling to a distance of 500 miles. In Fig. 2 the Marconi transmitting apparatus as used on shipboard is shown. Fig. 4 illustrates the arrangements of one of the Transatlantic wireless telegraph stations. The towers supporting the vertical wires are 220 feet in height.

Portable wireless telegraph outfits are now employed by most of the armies of

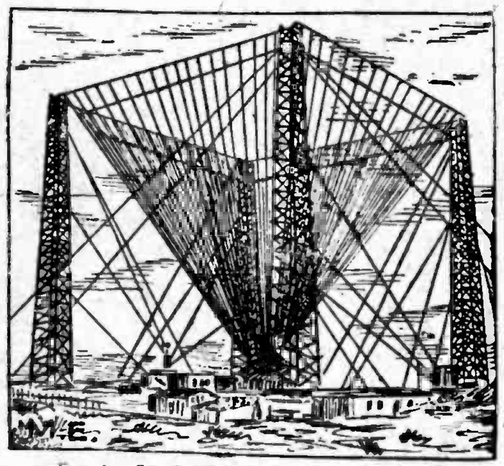


Fig. 4.—South Wellsfleet Transatlantic Station.

the world. In this case the apparatus, including the poles that support the vertical wire, are carried on wagons or on horse or mule back.

Recharging Dry Cells

It is very amusing to read the various "receipts" published from time to time how to recharge dry cells, and we feel certain that if the writer of these "receipts" had ever tried his own formula he would have found very soon that it was worth 95% less than what he claimed for it.

The writer, who for 2 years managed the manufacturing part of a large dry battery concern, believes himself capable to lift the veil from the mystery.

First let us get down to the bottom of the question and see how much success can be had from recharging old, worn-out cells.

A dry cell is almost universally made up with a carbon rod in its center, around which the depolarizer is packed. This consists of peroxide of manganese mixed with carbon powder or graphite to decrease the resistance. The depolarizer in turn is surrounded with an absorbent material, such as blotting paper, cardboard, etc., containing practically all the exciting fluid or electrolyte in its pores. This absorber or porous cell, as it were, also separates the positive (+) element from the zinc cup in which it fits snugly. The zinc cup furnishes the negative (—) pole. For certain manufacturing and commercial reasons the porous envelope is made extremely thin in proportion to the depolarizer. In fact, its thickness never exceeds 3/16" and often is a good deal less, especially in high-amperage cells. In this centers the relative short life of all dry cells and it explains why they give out in such a short time, when theoretically a cell should only stop furnishing energy when the depolarizer has given off all its oxygen and the zinc electrode has completely dissolved.

If the reader will kindly take a "worn-out" cell, take off carefully the zinc cup and put the positive element in a new zinc cup, after the former with its envelope had been soaked in water for a few minutes, he will be very much surprised to find the cell almost as good as new. What was wrong? Nothing; only the "worn-out" cell did not have enough electrolyte, which to any battery is as essential as air to our lungs.

There is no such thing as a "dry" cell. The more liquid a cell has the more energy it is capable of giving. Therefore, if you have a worn-out cell which has its zinc cup in good shape you can nine times out of ten recharge it *partly* if you go to work intelligently. The writer does not want to mislead anybody in connection with this topic, nor does he want to arouse false hopes. Always remember that when a certain battery has furnished a given amount of energy this must be taken into consideration, as no recharging, no matter with what process, will ever bring back the original amount of amperage and voltage, nor capacity.

A recharged dry cell at its best is only a consumptive individual, doomed to a rapid disintegration, but it is always worth while to lengthen life wherever practical. Therefore, if we can get one-quarter to one-third of the original energy from a recharged dry cell, we may call our efforts quite successful.

A good many "receipts" advise driving holes in the zinc cup by means of a nail, and then soak the battery in water, etc. Of all suggestions this certainly is the best to murder a dry cell almost instantly. None of these "formula" inventors ever took the trouble to investigate what happens when one drives a nail in a dry cell, and we give herewith an enlarged section of part of a battery, which at once makes clear why that method is totally wrong.

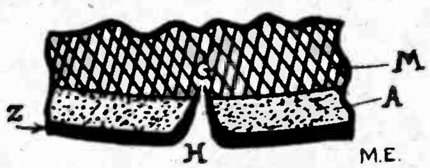


Fig. 1.

H represents the enlarged hole made by the nail, M is the depolarizer, A the porous envelope or separator, Z the zinc cup. By driving a nail in the zinc, part of the metal is carried inwardly, and as anybody can convince himself by a trial, the sharp edge of the hole, G, three times out of five will come in contact with the depolarizer, M. A short circuit is of course established, and the more holes punched in the cell the more short circuits will be made. The consequence is that the battery, even after soaking it in all kinds of fancy solutions, will die a rapid death.

The logical thing to do is as follows: Procure a machine drill of about 1/8" to 3/16" in diameter and drill holes carefully till the drill touches the carbon. Do not be afraid to drill through the entire portion of the depolarizer, as it is necessary that it gets air and electrolyte. It is obvious that drilled holes do not throw up a rim, but leave a flat, clean hole, making short circuit entirely out of the question. The writer would recommend boring about 8 or 10 such holes, being careful to see that all manganese (black filler) is carried out of the hole. Blowing hard in the hole will usually clear it perfectly. The writer also recommends to drill each hole as rapidly as possible, because the drill itself, being in contact with both zinc and depolarizer during the act of drilling, for the time short circuits the cell.

Next prepare a solution of 10 parts (by weight) water and 5 parts of chloride of zinc, which can be bought for about 50 to 60 cents a pound. Ten cents worth will do for a dozen dry cells. If the solution is kept in a well-stoppered bottle, it can be used over and over, as each cell does not absorb much liquid.

The solution must be well heated before used, but should not boil. Insert the cell in this liquid and leave it in same for about 20 or 30 minutes. The cells should then be taken out and rolled on the floor, which brings the superfluous liquid out of the holes. Each hole should now be inspected to verify if it is clean and if no filler touches the zinc.

Now dry the cell carefully, and if possible insert in each drill hole a dry wooden plug, which can be cut off flush with the zinc.

The battery is now ready for use and in most cases will register from 8 to 12 amperes and about 1.3 volts.

Piercing Glass Plates With Spark Coil

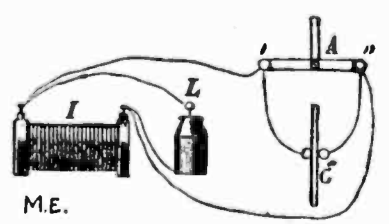
Our young friends possessing a one-inch coil and a quart Leyden jar can easily perform the interesting experiment of piercing glass plates as follows:

Connect Leyden jar, L, to induction coil, I,, as shown in sketch. A discharger, A, must now be constructed, which is preferably made of very dry wood, which had been boiled in paraffine or oil for about 15 minutes. It should have the shape as shown in cut.

The main part is about 6 inches long, in the centre of which a small handle is fastened by means of one or two woodscrews. Two binding posts, I and II, are fastened to the ends of the longer part of discharger. Two stiff brass wires, No. 14, and about 6" long, carry a small brass ball at their respective ends. The two loose ends are firmly attached to the binding posts of dischargers.

If now a glass plate, G, is placed between the two balls and coil is started, the plate will soon be pierced by the spark. The larger the coil, the heavier the plate may be.

When charging Leyden jars, as explained above, the sparks are much shorter, but they are very much heavier and give an intense bluish-green light, accompanied with a strange and piercing report.



The experimenter must be careful when carrying a charged Leyden jar not to touch the brass ball (connecting with the inner coating) with the free hand, as a tremendous shock will be the consequence and in most cases the jar will be dropped and of course broken

The Talking Gloves

By M. G. Hugo.

This interesting experiment can be performed by anybody without trouble, and those having a small induction coil, or spark coil, and a good supply of batteries can do it at no expense whatsoever. First we need a transmitter, M, such as used on modern telephones, and a local battery, B¹, composed of from 2 or 3 dry cells. Connect the transmitter and local battery in series with the *primary* winding of an induction coil, and be sure to screw down the vibrator so that it cannot work. Any induction coil can be used, such as a small medical coil, or, better, a regular spark coil, giving from 1/4" to 2" spark. We do not recommend larger coils, as they take too much current. This would require a very strong local battery, which in turn would greatly heat and probably spoil the transmitter, M.

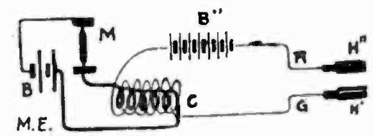
In series with the secondary winding we connect a battery, B², composed of about 15 dry cells or its equivalent in voltage, that is, from 12 to 18 volts. With little experimenting the right voltage will be found. It also will be necessary in most cases to change the polarity of either B¹ or B² to get the best results, as if both batteries work against each other the transmission of speech will not be as good and articulate.

To mystify a third party it will be necessary to lead wires R and G under the table and connect them to two nails or tacks, H¹ and H², which should be arranged so that they cannot be seen too readily.

Three confederates are necessitated; one is stationed at M in a separate room so that his voice cannot be heard; in the room where the demonstration is to be given also two operators, which take the third party between them. The left operator has one glove on his right hand while the right operator has one on his left hand. Attention is called to the fact that the gloves must be of kid and should be perfectly dry and warm.

The two operators now place the hands bearing the gloves flat and tight against the ears of the "victim" and touch with their free hands the tacks or nails, H¹ and H². If at the same time the person stationed at M talks in the transmitter, the mystified third party will clearly hear every word spoken in the transmitter, M.

As the two operators are not connected to any wires, the innocent party cannot imagine where the talking comes from, and is of course completely baffled.



The experiment can even be intensified if the two operators use a common piece of paper instead of gloves, which they hold flat against the ears of the third party.

The secret of the whole is nothing but condenser action. The high tension currents pass through the tacks up into the bodies of the operators and come to the gloves (or sheets of paper), which, placed against the ears of the "victim," act as condensers.

Lots of amusement can be had by giving "spiritualistic" seances to your friends by means of the above experiment. If the lights are turned down and the operator at M plays his part well and talks in a deep, monotonous voice, your friends will never forget their experience and are sure to believe in ghosts and spirits for a long while after.

During the experiment it is essential that the two operators stand on a dry floor, else the currents will go in the ground.

SLEEP PRODUCED BY ELECTRICITY.

Recent experiments conducted in France have shown that sleep can be produced by applying a weak current to the temples of the head. No bad after-effects, as for instance those when sleep is produced with ether and chloroform, have been observed with the new electric treatment. Great things are predicted for it.

MODERN ELECTRICS

A Magazine devoted entirely to the Electrical Arts.

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H. GERNSBACK, EDITOR.

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TO OUR FRIENDS.

The maiden issue of MODERN ELECTRICS is before you. We cannot but feel the deepest gratitude towards our supporters, whom through their support we have a right to call our friends. It is uncommon and we believe it to be the first case on record that a new magazine starts out with an actual *paid-up* subscription of several thousand copies. This subscription was obtained solely by writing letters to persons whom we felt sure would believe in us sufficiently to order their subscription in advance for a magazine of which they never heard, nor thought of.

We believe our phenomenal success is attributed to the true ring of our circular letter and we reprint a few lines, which we know "touched the spot:"

"The publishers of the new magazine, from their vast experience *know* what young men want. The thousands of inquiries asking for all kinds of information show that the amateur is in need of knowledge which cannot be found in our best text books.

The publishers of the future magazine know this. They realize what the experimenter wants to know and thereby have solved before the start the most important problem of a magazine: i. e., to print what their readers *WANT*, not merely what strikes the editors' fancy."

This tells the whole story. Our policy in the start and in the future will be to please you and to serve you with the very best obtainable.

MODERN ELECTRICS shall be and must be YOUR paper. We have enough faith in our undertaking that we say now: "Once a reader of MODERN ELECTRICS always a MODERN ELECTRICS reader."

You cannot do us a greater favor than criticising us when you think we are not up to date, you will win our gratitude by telling us when we err. We wish to please YOU, and everybody who reads "M. E.," as in this fundamental rule the success of our magazine depends.

If you don't like MODERN ELECTRICS, do not fail to tell us. If you do like it, please tell your friends, and urge them to subscribe, as only through a large circulation can we serve you as you deserve it.

The editor, a year ago, conceived the idea of founding the present paper, after he had satisfied himself that there was no exclusive electrical paper in existence catering to the public, the amateur electrician and the electrical experimenter. There were trade papers, purely technical and theoretical magazines, mixed periodicals, etc., but no electrical paper written so that anybody could pick it up and understand it.

Furthermore, it was resolved that MODERN ELECTRICS should not be a "paste pot and scissors" paper, as is now in vogue by publications who make up nearly their whole copy by "borrowing" articles from contemporaries and from text books. They put an old article in a new dress and fool their poor subscribers. In other words, the potatoes and gravy are their own, the roast however is stolen!

By glancing over the maiden issue of MODERN ELECTRICS we admit that there is room for a good many improvements, but nobody can accuse us that we do not strive hard to be original, and original we shall be to the end. You can feel assured that you can look with interest towards every new issue of this paper. You will not be served with warmed-over prehistoric articles, which create mental dyspepsia, but "M. E." will show you things which will make you "sit up and take notice."

It is, of course, self-understood that this magazine does not publish anything but matter pertaining to Electricity and Magnetism. In sending in questions be kind enough and bear this in mind, as only such, dealing with the above arts will be considered.

We also wish to advise you not to give away copies of "M. E." to friends and acquaintances because you surely will sooner or later need a certain number for reference. If your friends like the paper, tell them to order it through their newsdealer.

In conclusion, we again wish to thank all our friends for their faith shown in our undertaking and for their so very kind support; as it is impossible to write each personally, we trust that all will recognize these few lines instead. We pledge ourselves to do the utmost to satisfy our friends and to deserve their good will and their kind support.

Beginning with our next number we will publish each month photographs of laboratories and work shops of our young experimenters.

It is surprising to find how many young men in these days are the proud owners of well-equipped little shops and the editor knows quite a number of young people who are conducting at the present writing experiments of which many professors would not be ashamed of.

We dare say that electrical shops and experiment rooms are in the plurality in this country and probably 2 out of 5 boys are usually found to be quite interested in the electrical arts.

It is the editor's desire to get acquainted with every good electrical laboratory in this country and to that effect he desires good, clear photographs of them and a short description by its owner. The principal apparatus may be cited, how many and also a short sketch of the owner's life and habits. Each photograph must bear the name of the sender on its back, and the original will only be returned to sender if return postage is added.

One to three photographs will be published each month; the best of the three will be awarded a *prize of three (3) dollars.*

In sending in articles it is absolutely necessary that same be written on one side of the paper only, each page numbered and kept apart from other communications not pertaining to the article. The text should be written as carefully as possible in each instance; if typewritten, so much the better.

Laboratory and experimental shop photographs and articles should be addressed to Laboratory Contest, care of MODERN ELECTRICS Publication.

The Wireless Department of MODERN ELECTRICS beginning with next issue will contain a contest describing amateur wireless stations. We will until further notice reprint in that department good photographs and descriptions of small stations, such as are in vogue now all over the country.

There is hardly a village now in the United States which has not one or several young men who own their stations and most of them, as we are informed, work their instruments to perfection, despite the fact that the latter are anything but precision apparatus.

The usual thing is that two friends living a few blocks or even miles apart invest in the necessary instruments and "rig up" two miniature plants, which, after some fruitless trials and experiments, at last yield and prove to be in most cases entirely successful to their respective owners. It is surprising to find how much ingenuity these lads display to get their instruments to work at all times under all conditions and they do, in most cases, not satisfy themselves with simple apparatus either.

Home made tuning coils, condensers, new fangled detectors, etc., come into play and the scientific visitor is amazed that these young men can maintain regular "service" at all hours of the day and night.

The editor knows of a clique of 4 boys in Massachusetts who communicate among each other after school hours and they have brought the thing to such perfection that they can communicate with each other crosswise, that is, No. 1 can talk with No. 3 *at the same time as* No. 2 talks with No. 4. The stations do not interfere with each other unless desired. The houses of the 4 parties are about ¾ of a mile distant from each other The system in use will be described in a later issue of MODERN ELECTRICS.

Naturally every one interested in the art is anxious to know what everybody else does and how he does it. We think that our "Amateur Wireless Station Contest" will find the hearty approval of all our young "wireless" friends or, as the local papers term them: "Aerographical fiends!" Therefore, get busy and show us what *you* have done and what you have to show.

The best description and best photographs published will get *Three* (3) *Dollars* each month. As the aerial or antennae is of high interest to most experimenters a good photo of same may be included. Address all articles, etc., pertaining to above to "Wireless Station Contest," care of MODERN ELECTRICS Publication.

On account of sickness of two of our writers, it was impossible to print in this issue several articles which we promised to our subscribers. We have part of the articles now, but they were received too late for this number. Several other interesting articles had to be substituted, and we trust that our friends will be patient till next month.

"The Telefot," or how to "see" electrically by wire, the speaking arc lamp, a pocket power battery, how to make an electric chicken hatcher, etc., will be found in the May issue, together with a score of other very interesting ones.

A good many readers will probably be interested to know to whom belongs the honor of being the first subscriber to "Modern Electrics"; as may be guessed, a New Yorker claims the title.

His name is Captain C. P. Maxson of S. S "El Norte," an enthusiastic wireless telegraph "fiend" and inventor of different new appliances in wireless telegraphy.

Captain Maxson makes all his own apparatus, including a 12" coil, which he built entirely himself and which is a complete success. The sending distance during the night is about 75 miles over water. A silicon detector made by Captain Maxson is used in connection with a tuning coil and 1000 ohm telephone head receivers.

WIRELESS TO COLON.

ANNAPOLIS, MD.—The wireless telegraphic station at the United States Naval Academy is now exchanging messages over a longer distance than at any time since its establishment, and has lately set up an entirely successful line of communication with Colon, Isthmus of Panama.

The Annapolis station is largely an experimental one.

NOTHING NEW UNDER THE SUN.

WIRE: Did you read that Prof. Digger found a remarkable wire system in one of the big pyramids during his visit in Egypt? He thinks it proves that the old Egyptians certainly knew all about telegraphy

LESS: What of it. While I visited the big Cheops Pyramid, a most careful search did not reveal any wires at all.

WIRE: Well?

LESS: Which of course proves that they knew all about wireless telegraphy!

Experiments in Static Electricity

By J. H. HOOTON.

At the present time static or frictional electricity is the least explored field of electrical phenomenae. Until lately, the reason for this apparent lack of interest was that proper apparatus for experimental purposes were too expensive, and most unsatisfactory, as in damp or humid weather even the so-called reliable machines failed to generate, and this always seemed to happen when they were most needed.

The static electric effects, produced by two 8" glass plates revolving in opposite directions, in close proximity to each other, are most remarkable and interesting. With two small Leyden jars, to collect and condense the electricity generated, a thick and explosive spark, 3" long, is obtained, that easily bores through eight or ten cards. With a single quart Leyden jar a purple-blue spark about 1" long bursts out that will tear through a thin sheet of glass with a report like a small cannon. With two of these large jars the effect is simply terrific.

Four or six Leyden jars in series produce a long, thin flame at the spark gap that constantly darts about in a thousand directions and reminds one of the rapid play of a snake's tongue. With six or eight jars in multiple a short, condensed spark rips the air with a report so intense that it fairly tears at the ear drums; it comes so rapidly that although it is expected, the effect is always startling, and when the discharge has passed we look at the two small circles of glass and marvel that such forces are hidden within them.

The writer looks ahead to most interesting and possibly startling discoveries with the frictional current that will be brought forth by the researches of the army of experimenters with static electric apparatus during the next few years.

There has always been a great amount of interest in the attraction and repulsion of light bodies and there remain quite a few things to be discovered as yet. To describe one interesting and particular case: Particles of iron when attracted to either pole of a static machine are repelled to a distance of a foot or more, but particles of gold of the same weight will be violently thrown to a distance of three or four feet. A mixture of gold, iron and sand will be instantly distributed into three parts with the sand nearest the machine. Particles of different substances presented to either the positive or negative pole are always attracted and then instantly repelled.

The writer has lately found an exception to this rule, which offers a series of experiments that may lead to interesting discoveries. A common lead pencil was placed between the fluoroscope and an excited X-ray tube so that the central graphite rod of pencil could be seen. Feeling a strong pull on the pencil the writer found it attracted and clinging tightly on the tube, and instead of being repelled, as is usual with all statically attracted bodies, the pull was found to be constant. The pencil, pieces of paper and other substances were tried on all parts of the tube, to which they were attracted, but not repelled. To find if the vacuum played an important part in this result a plain empty glass bottle was substituted for the tube; the conducting cords from the two machine poles were simply tied to the bottle, one at each end. The results were the same as with the tube, with the exception that the attraction pull of the bottle was not so strong. Both tube and bottle were tried suspended in air to partly insulate them and then adjusted to a wooden stand; no difference was found by the change in position. The two static charges, positive and negative, undoubtedly travel slowly over the outer glass surface and seem to unite and by doing so lose their repelling qualities. It was absolutely evident that the attraction pull was double the strenght of either spark ball terminal alone.

The secondary current from an induction coil is the same as a frictional current, only that its amperage (quantity) is higher. Thinking this over one day and remembering that for telephone work the low voltage of a few cells is transformed by an induction coil to a high voltage, the author wondered how static electricity would act on a telephone line. Securing a rubber comb, it was found that a good charge could be collected from the hair. The writer then called up a friend 18 miles away and explained to him what he was about to do.

Standing on two china plates he detached one of the receiver cords and held the free end in one hand and presented the charged comb to the binding post that had held the receiver cord. The click was heard very loudly in the receiver and the distant friend answered at once that it was plainly audible to him. It is possible that static electricity could be used for telephone purposes if it could be absolutely controlled. It is an interesting fact that by the means of a common rubber comb and a head of hair a force can be generated that can be made to send a message over a wire if the dot and dash of the Morse code is used.

One of the most beautiful of color effects can be produced by suspending a 1 to 1½" wooden or rubber ball on a *silk* thread between the two poles of a static machine; the ball to be coated with gold or bronze paint and the silk thread to be 12 to 15" long. The spark rods are to be drawn well back and when the machine starts the ball receives a charge from one of the poles, when it is immediately repelled by that pole and attracted by the opposite one. This opposite pole after attracting it immediately repels it. Under this attraction and repulsion the ball moves rapidly back and forth, up and down, and whirls in a hundred circles, all this time beautiful purple-green streams of sparks are running over the whole surface of the sphere.

Looking closely and carefully, it will be seen that the light effects are caused by little arcs between the metal particles which are so near to each other that they resemble intensely beautiful and minute beads of light. The color effect is caused by the volatilization of the metal particles.

Currents obtained from even a small static machine are highly beneficial, when applied to the human body. The writer has devised a small compact apparatus whereby eight different degrees of current strength can be taken from a machine. To be clear: the strong explosive Leyden jar spark is gradually reduced by means of small condensers. This device is made up of six glass plate condensers, which are introduced one by one in series, with the outer coating of the Leyden jars.

Two pieces of flexible wire cords, each two feet or more long and covered with a rubber tube, are then connected to the spark rods, one to the positive and one to the negative. On the ends of these cords are metal electrodes, one to be held in actual contact with the hand or any part of the body, and the other electrode is applied over the seat of pain, *outside* of the clothing. The writer has seen a severe attack of rheumatism relieved in a few minutes with this apparatus, and it can be used also in the treatment of lumbago, sciatica, neuralgia, headache, etc.

In some experiments a high tension spark must be reduced to a degree of strength that can be again found with certainty. The above device makes that thing possible and is really a rough apparatus for the measurement of static electricity.

The writer never thinks of lighting the gas in the laboratory with a match, but uses the static machine; a few turns of the handle and subsequent discharge of a Leyden jar near the escaping gas is more trouble than to light a match, but the scientific mind finds always pleasure in the act.

An incandescent bulb is used sometimes as a Leyden jar when presented to the pole of a static machine. If the filament happens to be broken and the outer thread metal part is held in the hand at the same time, allowing the current to play only on the center connection, the spark will leap across the broken filament ends, which are made to move by their attraction and repulsion and thereby cause changes in the arc length.

All this time the lamp is emanating a soft, dull, silvery glow that changes with the arc length. At times this luminescence is of a pink or violet hue, softly toned by a silvery glow.

By holding the glass part in the hand and presenting the metal end to one pole of the machine, a strong charge is quickly accumulated; by touching the free hand with this metal end, a severe shock is felt, or it can be discharged by presenting it to any good conducting body.

That the lamp acts as a Leyden jar is

(Continued on Page 30)

Auto Equipped With Wireless

By Our Brussels Correspondent.

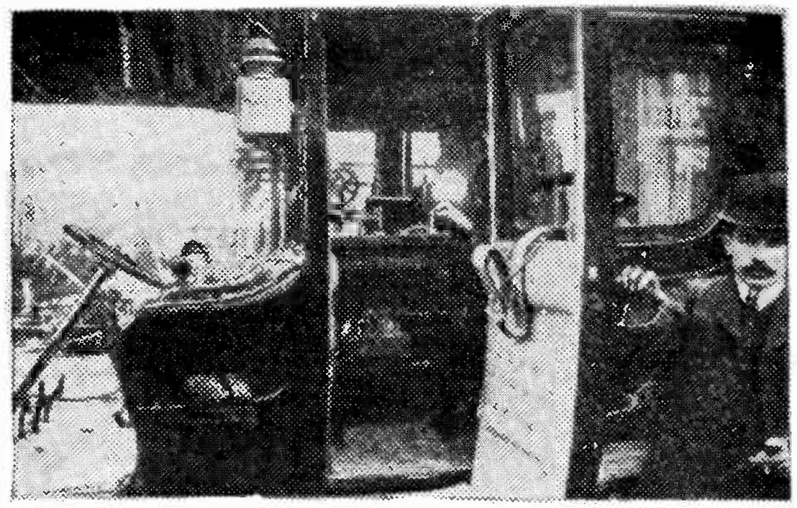


Photo by N. E. Auto Journal

We reproduce herewith a photograph of a novelty exhibited at the last Brussels automobile show. It is a regular wireless sending and receiving station installed in a Limousine car in use by the artillery corps of the Belgian army, and so far has proven entirely successful.

In the interior of the body the operator is seen manipulating the sending key. Under the table a 4" Rhumkorff spark coil is installed, also the storage batteries for sending and dry cells for receiving.

On the table on the left side of key are the coherer and tape register; the oscillators and adjustable condensers are in the background. The coherer is suspended in a four-ring pivoted system, which, in turn, is suspended on strong rubber bands. This arrangement makes it possible to receive messages accurately and keep the coherer always horizontally. Shocks and vibrations resulting from travelling over rough roads have little effect on the arrangement. The antennae is a collapsible mast, which is about 10 feet high; it is attached on the roof of the Limousine. If obstacles are encountered, the mast can be laid down on the roof. An extra antennae is also carried and can be fastened on top of the regular aerial mast. It is made of thin brass tubes, which telescope into each other. Extended and placed on top of the regular mast, the height of aerial can be increased up to 25 feet.

The ground connection is made by trailing a metallic netting between the rear wheels of the automobile. This has been found quite satisfactory and gives an excellent "ground," except on very dry, dusty roads or on very dry asphaltum streets.

CATCHES PORTO RICO WIRELESS MESSAGE IN NEW YORK.

A wireless message from San Juan, Porto Rico, was picked up recently by an experimental receiving apparatus installed in the tower of the Times Building, in Times Square, and was clearly read by the operator after the stations at Washington and Key West had declared they could not "take" it on account of interference. This was incidental to a series of experiments being conducted by John L. Hogan, Jr., of Cos Cob, Conn., who is perfecting an instrument to prevent interference in the sending and receiving of wireless messages. The distance from San Juan by air line to the Times Building is approximately 1,600 miles.

How to Make a "Dry" Storage Battery From a "Wet" One

By H. Gernsback.

Storage batteries, as desirable as they are, on account of their steady, strong current and other good qualities, often exasperate the experimenter on account of their one great default—slopping and spilling of the electrolyte (acid).

This especially is true of the so-called open type, that is the kind which comes unsealed, and without vents, and consequently having acid and plates open to view.

How many times did it happen that a cell fell down and emptied its contents over instruments, clothes, etc., and did considerable damage, or how many times did a cell break in transporting it from one place to another, and besides from doing a good deal of damage stopped giving current, as the loss of electrolyte put it, of course, out of commission.

By offering the formula and his long years of experience, the writer feels certain that his article will be welcomed by hundreds, who up to the present writing had troubles of their own with storage batteries.

The formula has been tried over and over, and a considerable number of storage batteries of the "dry" type, made by the writer, are now in use on several of the United States battleships, and are giving, as far as we are able to learn, excellent service.

Of course it is self-understood that such a thing as a perfectly dry storage cell is impossible. The idea is to get the electrolyte in a state where it does not flow nor run out of the container, even if turned upside down. It is essential that such a combination should contain as much acid as possible, else the internal resistance of cell will be too high and the capacity (ampere hour output) is reduced considerably. In fact, the best constructed "dry" storage battery will always give from 10 to 15% less capacity than a "wet" one, which is attributed to the fact that the acid in a dry storage cell cannot circulate as well as in a "wet" one.

It is also essential that the "dry" electrolyte be porous and spongy-like, which of course allows good circulation of the acid.

Almost any type of storage battery can be made into the dry type as follows:

First discharge the cells down to 1.8 volts. Then procure a piece of best asbestos board or sheet, which should be as clean and white as possible. Shred it into fine pieces or flakes, as small as feasible. Soak the flakes in distilled water and boil them for one hour. After this they should be dried so that all the moisture is sure to come out.

Now pour into a non-metallic vessel 12 parts (by weight) diluted sulphuric acid (electrolyte) of 1250° specific gravity. Then add 3 parts (by weight) prepared asbestos flakes. Mix the acid well with the asbestos so that a uniform liquid is obtained. To this add under *constant stirring*, slowly, 1 part (by weight) silicate of soda (waterglass) of 1180° specific gravity. It is of the utmost importance that the liquid is stirred well till all the waterglass is added, if not, lumps will surely form. It is well to continue stirring for about 1 minute after the mixing, until a homogenous fluid results, having a somewhat oily appearance.

Now take out the elements from your cells and rinse them in water. Throw away the old acid and wash out containers. This should be done as quick as possible and may preferably be done before preparing above fluid.

Put the elements back into their containers, after everything had been dripped off. Next pour your prepared liquid in the cells till it comes ¼" over the top of plates. The elements should *be* "shaken up" then, a necessary operation, to get the somewhat dense fluid between and around all the plates. This "shake up" process is nothing else but lifting the elements up and down about 4 or 5 times with a plunge-like movement. If the plates are not less than 1/16" apart, the mass will get between them after the shaking. It is, of course, understood that each element should retain its separators or still better, the plates should be spaced with narrow spacers made of hard rubber, glass, celluloid (or even wood; (same will not be destroyed as long as kept in the acid). Such spacers are usually ¼" wide and about ⅛" thick. To keep them in place, acid-resisting rubber bands should be put around elements; their pressure will keep the spacers from moving.

If the cells are inspected one hour after filling they will be found to contain a spongy, jelly-like mass which will not flow.

The cells should now be charged in the usual manner. After charging it will be usually found that the solid electrolyte is covered with liquid acid. This is superfluous and may be poured off, or syphoned out with syringe or pipette. The battery may now be discharged and worked as usual.

The solid mass will outlast the plates, but as the water contained in the acid constantly evaporates, it is essential that a little distilled water is poured on top of the mass each time the battery is recharged.

If the cells are not equipped with a cover, they can be sealed easily by pouring melted asphaltum or pitch on top of the solid electrolyte. An opening, however, must be provided to fill in water and let off the gases. Such an opening is best made by simply placing a short glass or hard rubber tube in the centre of cell on the spongy mass before pouring the sealing compound.

A cracked or broken jar will not put a dry storage battery cell out of commission, because the electrolyte cannot escape entirely.

If it is desired to make the mass stiffer add more silicate of soda, however, this increases the resistance.

How to Make an Extremely Sensitive Galvanoscope

Procure a glass vessel with as thin walls as possible. The shape should be preferably as per our cut. If this cannot be had, a vessel with straight walls will do.

Next get a piece of barometer glass tubing with fairly thin walls, not thicker than 1/32". The bore should be about 1/16". Supply houses usually carry such tubes.

Bend the tubing in an alcohol flame to a right angle.* Draw the shorter piece out to a fine point by means of alcohol or other hot flame. Break off the point so as to leave an extremely fine opening in the tube (see figure). This aperture should be so fine that it cannot be distinguished with the naked eye.

Now fill your vessel with mercury so that it covers the bottom of same. On top of this fill electrolyte prepared by pouring 1 part of sulphuric acid (oil of vitriol) into 10 parts of water. (Oil of vitriol *must* always be poured into the water, never vice versa, as an explosion might occur.)

Now fill your finished tubing with mercury about half-way up. Bring the upper part of tube through a cork, into which it should fit tight.

A silver or platinum wire goes through the cork down to the bottom of the vessel to make contact with mercury. A similar wire is then introduced in the open part of the tubing to make connection with the mercury.

If the two outleading wires are now connected to an old, nearly worn-out dry cell, the thin capillary thread of mercury in the fine point changes its position. The thread will move a greater distance the stronger the current is. Too high a voltage squirts the mercury out through the fine aperture. Too much mercury in the tube has the same effect.

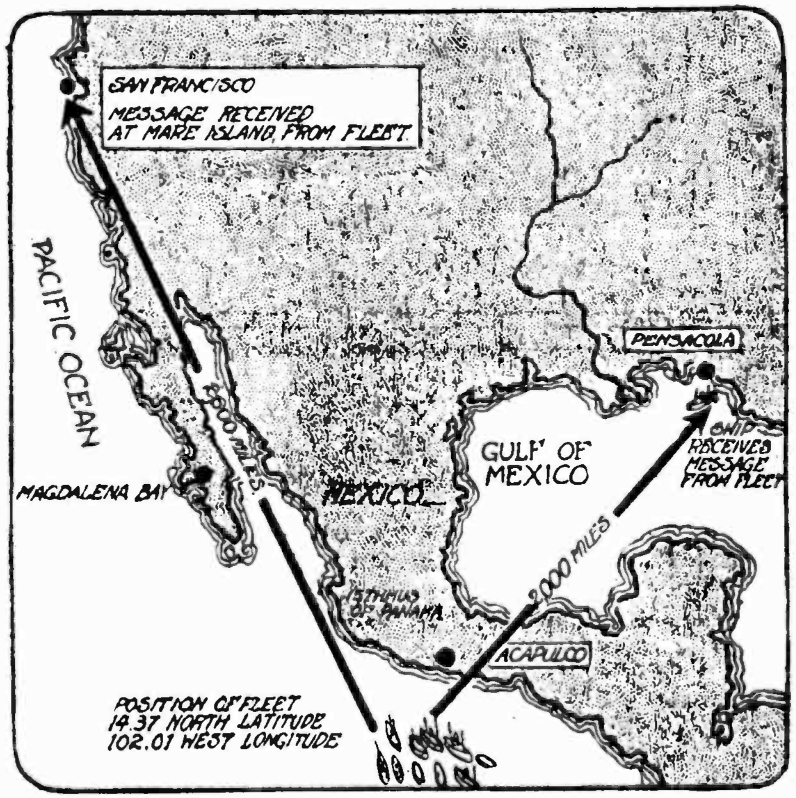
If carefully built this excellent instrument will record a pressure of 1/300 volts. It works on both direct and alternating current.

It is as sensitive as a good many instruments costing $10 and higher and will last for a long while.

*If you have never bent glass before consult article on "Glass-bending" in this issue. It is found under "Technical Notes."

Wireless Department

U. S. N. Makes Two Wireless Records



The United States battleship fleet, in the first part of March, transmitted two remarkable wireless messages from its position 14.37 north latitude, 102.01 west longitude. The fleet was then off the Pacific coast on its way to Magdalena Bay.

The first message traveled 2,000 miles before it was picked up by the liner "Creole" off the Florida coast. It was then forwarded to New York, a distance of 1,100 miles.

The second message was transmitted direct to Mare Island, partly over water and partly over land. This distance is a little less than 2,600 miles.

The messages stated that the fleet was in excellent condition and would reach Magdalena Bay two days ahead of its schedule.

When one considers that the sending stations on board of ship are naturally limited in size and power, the efficiency of the system in use gets apparent and is worthy of the highest praise.

Nearly all the ships of the fleet are now also equipped with wireless telephones which are claimed to work up to 50 miles. These instruments are of tremendous value to the fleet, as orders and commands from the flagship can be given to the other ships in a much quicker and more satisfactory manner than could be done either by wireless telegraph or by the flag code.

Wireless telephony is largely responsible for the beautiful manoeuvres, "falling in line," etc., of the ships, which have attracted general attention everywhere, since the start from Hampton Roads.

"Modern Electrics," in a later issue, will describe the apparatus and the system used on board the United States battleship fleet.

How to Remedy Troubles in Wireless Telegraph Instruments

A young experimenter on the Pacific Coast wrote us, saying that everything he had tackled during the last few years he was able to "get away with" until he "stumbled over wireless telegraphy," which, using his language, "knocked him out." He also ventured to say that "Wireless is synonym with trouble," and if we did not help him out soon he'd commit suicide.

To him and a good many others new in the art we can only quote this golden rule: "Learn to sharpen your senses and learn to observe." You will never be a successful "aerographer" until you have mastered this rule.

There are experimenters who were never shown nor advised and who can "feel" with their instruments. They know nothing of the theoretical part and still they have a sense which tells them just where to look for trouble and how to remedy same speedily. Such persons will take hold of the most complicated apparatus and work it successfully as soon as their hands touch it; the mysterious sense which guides them and which we can term "electrical instinct" is forever alert and seems to come in direct contact with the soul of the apparatus, as it were. Such fortunate persons are few compared with their less lucky mates, under whose hands apparatus seem to go to pieces as soon as they touch them. They will look at the most impossible places trying to locate the trouble and work for hours at a stretch, only to find after a short reflection that a loose binding post caused all the trouble.

In hunting trouble it pays to start first working the brain and afterwards the hands. If vice versa more trouble is sure to arise.

We do not wish to be set down as preachers, but we believe our long years of experience should be recognized, and we shall be happy to offer this experience to our young friends new in the art.

TROUBLE IN THE FILINGS COHERER.

When a coherer is new it is usually found to work satisfactory, but after a few weeks or months it commences to "sag" and works sluggishly.

If the coherer is located in a room or place subjected to dampness, the trouble most likely is in the filings. Take the coherer apart and strew the filings on a piece of absolutely clean, dry paper. Hold same over a hot stove and heat the filings for at least ten minutes as hot as the paper can stand it.

Next take a toothpick, around which wind some absorbent cotton to form a plug, which should fit the coherer glass tube snug. As it is important that the hand or fingers should not touch the cotton, cover your fingers with a clean handkerchief, so that nothing but the clean linen touches the cotton plug. Next clean the tube thoroughly with the plug until it is perfectly dry and clean.

Then clean and dry well the metal coherer plugs, after which the filings can be inserted again. In most cases the coherer will be found to work as good as before.

If there is a suspicion that the filings came in contact with the fingers or greasy material, they must be thrown away and new filings be inserted. If this is impossible or impracticable, the old filings should be washed in a solution made of 2 parts of strong liquid ammonia and 10 parts of distilled water. Pour this in a common drinking glass and let the filings stand in this solution for 15 minutes; then pour off the liquid, which sometimes gets light blue in color. After every drop has been poured off, place the glass with the filings on a hot stove till all the liquid has completely evaporated. Pour the filings on a new sheet of clean paper, and when tried they will be found to work better than ever.

Never under no circumstances should any of the coherer parts be touched with the fingers. The natural oil of the skin when touching any of the filings will form a film of oil over it, and thereby completely insulates the filing. Even a mere breathing over the filings puts them out of commission frequently, which is the reason that one cannot be too careful by handling them.

It is also a good plan to clean the coherer plugs with above ammonia solution, if the coherer should, despite all other reasons, fail to work properly. Of course, after washing, the plugs must be dried very carefully over a hot stove, so that every trace of humidity is sure to disappear.

In this instance bear in mind that the greater the signaling distance the more filings should be used. For distances under a mile, with a coherer plug 1/8" diameter, use about 1/16" filings (measuring parallel with the tube). For distances up to three miles use 3/16" filings. For longer distances the distance between the plugs should be about 1/4", but hardly ever more than this, as the coherer resistance grows enormously if more filings are added.

The decoherer, which usually consists of a 5-ohm bell, must be well adjusted in order to perform its functions satisfactory. A common mistake which beginners make is that they let the tapper of the decoherer strike too loose against the coherer tube. This invariably results in sluggish working of the coherer. It cannot work "sharp" and often keeps on working after the wave had passed. Naturally no intelligible signals can be made out, and to overcome this defect it will be necessary to have the tapper strike the tube quite hard, as only then the filings will decohere perfectly.

If the glass tube is of the imported type (Bohemian hard glass) there will be little danger of breaking it. If, however, such glass cannot be secured, a hard rubber tube, which must be very smooth in the inside, should be substituted.

The latest thing in coherer tubing is made from celluloid. This is an imported article and can be procured through electrical houses. This material presents a good many advantages. Being transparent, the filings can be readily seen in the inside of the tube. As celluloid is extremely tough and elastic, it is of course out of the question to break it or fracture it. The hardest blows will have no effect whatsoever and the constant danger of defective tubes—in transit or in actual use—seems to be overcome at last. Another, and perhaps the greatest advantage of celluloid tubing, is that it can be made to fit the coherer plugs absolutely air tight. This is quite important, especially for stations on or near the sea, where moisture is abundant and generally plays havoc with filings after they have been in use only a very short time.

Most experimenters find that after trying to signal over 1/2 mile the decoherer works after receipt of the wave, in other words, it works when it should not. If the relay is adjusted stiffer, the decoherer will not work at all. The defect, therefore, is in the coherer or decoherer.

The fact is that if the adjustments are very fine, the minute sparks on the contact points of the decoherer are sufficient to create oscillations and the filings will cohere, which in turn operates the decoherer.

The sparking at the points must be stopped, which is best done by means of a non-inductive resistance of about 1,000 ohms. This resistance can easily be made by anybody as follows: Wind about 12 feet of single cotton covered German silver wire No. 36 on a spool. Then wind exactly the same number of feet on another similar spool. Now connect the free end of the wire of one spool with the free end of the other spool. This connection should be soldered and insulated.

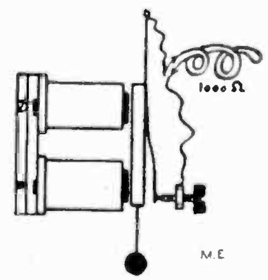


Fig. 1.

You have now a *double* wire, which you can wind on a small spool. The two ends are connected to the contact points of the decoherer (Fig. 1). The idea of winding a double wire on one spool, or as commonly called bifilar winding (Fig. 2), is to destroy all inductance and all electro-magnetism. Each wire tries to destroy the effects of the other, which is necessary for the work this resistance is intended to perform.

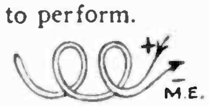


Fig. 2.

Where still greater sensitiveness is desired, the relay contact points should also be shunted with a 1,000-ohm non-inductive resistance. This will do away with all local sparking and the instruments will be found to work very sharp and exact.

(To be continued.)

"Knick-Knacks"

How to Make an Electric Whistle

By G. H. Rose.

This interesting instrument is based upon the principle that a short taut wire emits a high pitched sound if it is vibrated at an extremely high speed; the instrument is made easily and with little expenditure.

A wooden base, 2x4", is made first. An electro-magnet, such as is found on common vibrating bells, is erected vertically on base and fastened thereto by means of a screw or other means.

Two brass pillars, M, M', 3/8" in diameter and 1/8" higher than the electro-magnet and about 1 3/4" apart (measured from center to center), are fastened very securely to the wooden base. These brass posts must be very rigid, as upon this the whole success of the whistle depends. The pillars at the top have a hole tapped to receive a regular machine screw, size about 1/4" long, thread 8/32.

A brass or iron bracket, T, is bent as shown in sketch. The long vertical piece is about 1 3/4" high, the one at the top 3/4" long and the one at the base 5/8" long. The thickness of metal should at least be 1/4", the width 1/2". At the bottom leg two holes are drilled, to fasten bracket to base. The piece at the top has a hole tapped to receive thumb-screw, S.

A short piece of steel piano wire (thickness about No. 18 or 20 standard wire gauge) is spanned very taut between the posts, M and M'. At Pt a thin piece of platinum foil is soldered securely; it is necessary that same is horizontal, i. e., its plane should run parallel with the plane of the wood base.

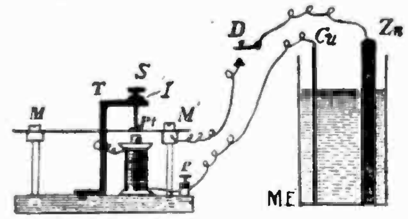
A thumb screw, S, with a long and fine thread, has a stiff piece of platinum wire soldered at its end, which serves to make contact with the platinum foil, Pt. A check nut, I, is provided to keep S from unscrewing, once adjusted.

Now connect one end of the electro-magnet wire with T, the other with binding post, P.

The outside wiring is clearly shown in drawing. One wire from battery goes to P, one wire from push button, D, to M'; the remaining wire from D goes back to battery to complete the circuit.

Best results with the whistle are obtained when the taut wire is about 3/32"-1/8" away from electro-magnet core and not more than 3 dry cells (or their equivalent) are used. Thumb screw, S, must be adjusted carefully, as the whistle only gives a clear trumpet-like sound at certain positions of screw, S. If it is screwed down too tight, a screechy sound, or no sound at all, is experienced. Screwed up too high, the sound gets deep and unmelodious.

When the best tone is finally obtained, check nut, I, must be screwed down very tight, else S will soon work loose.



This whistle is operated the same as a bell. It can be improved by placing it in an empty cigar box, which should have a hole at the top to receive a standard phonograph horn. The whistle when operated as a bell by means of push button (which may be distant) gives a very pleasant tone, quite different from a bell. It is especially recommended as a door bell or burglar alarm.

Different qualities of sound are obtained by substituting different size wires between M and M'. If the sound should not be loud enough for certain requirements, a stiff steel watch spring, 1/8" wide, is spanned between the two posts, instead of the steel wire. This furnishes very penetrating sounds, capable of being heard a good distance off.

ELECTRIC ALL RIGHT.

Uncle Ben—Say, Cholly, why do they call New York the "Electric City?"

Cholly—Cinch. 'Caus the town has a CURRENT on each side of it, a BATTERY at the end, and CROOKED TUBES below.—"*Fips.*"

How to Make a Mercury Interrupter

This kind of interrupter is very desirable and has the great advantage to heat little, while a large current can be sent through it. It is especially desirable for large wireless coils and, if desired, it can be constructed so that the vibrations are slow or fast, to suit different purposes. Its cost is very low and the vibrator can be made by mostly anybody in very short order.

Procure a standard binding post S, as per our engraving. A stiff steel or hard brass spring F, about 1/32" thick, ½" wide and 2½" long, is attached to binding post S by means of a screw. On one end it carries a soft piece of annealed iron, E, preferably shaped as shown in drawing. The weight of this piece is found by experiment, as no two coils will work well with the same weight. The stronger the current and the larger the coil, the heavier the iron piece must be. However, one must be careful, as too heavy pieces give rather slow vibrations. The iron piece is best attached to spring with two small screws (not shown in engraving). We would not recommend soldering, as it is rather hard to solder iron successfully.

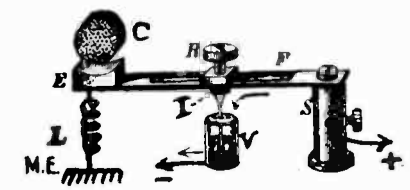
A slot, about 3/16" wide and about 1" long, should be filed in the middle of the spring F to make the thumb screw R, with its check nuts movable. This is clearly shown in our sketch.

A fairly stiff spring L is now fastened to spring at E to keep the armature from hammering against the core C of coil.

Next get a brass thumb screw R, standard size (any hardware store) and two check nuts. At the lower part of screw drill a hole and solder in same a platinum wire, gauge 14 or 16 B. & S., of suitable length.

Now get a small *iron* vessel V, on which a copper wire is fastened by means of a screw. If possible this vessel should be screwed down on the base which carries the vibrator. It can be done easily by merely tapping a hole in bottom of vessel to receive a small iron machine screw. This screw goes through the main base and keeps the vessel from falling. Several holes should be bored in the base to enable the iron vessel to move sidewise; it can then follow screw R, if quicker or slower vibrations are required. Do not use any other material but iron for the vessel, as the mercury used in it would soon destroy any other metal.

A small amount of mercury is now poured in the container and on top of this a film ⅛" thick of pure alcohol. Adjust the thumb screw R so that the platinum point dips about 1/16" in the mercury; this depth usually gives good results, although it may be varied to suit special requirements. Once adjusted where best results are obtained, check nut I is tightened to keep R from moving sideways or working loose.



To prevent splashing, vessel V may have a cover made of wood or card board, through the center of which the platinum wire is inserted.

By moving R and its check nuts towards the left, faster vibrations are obtained. Slower vibrations by moving to the right.

This vibrator usually needs a condenser and is capable to carry 25 amperes, providing, of course, the platinum wire is large enough to carry such a current.

LIFTING ELECTRO-MAGNETS.

Lifting electro-magnets come in use more and more each year. Factories handling heavy pieces of iron and steel cannot praise the electro-magnets enough. The largest electro-magnet built so far is able to lift 25,000 pounds with ease. A large Pittsburg hardware store uses the magnet to handle 80% of the house's hardware. Nail and bolt kegs are lifted rapidly and safely, and as the magnetism passes through wood as easily as through air, the keg stays of course intact.

Technical Notes

GLASSWORKING.

The average experimenter very frequently comes across an apparatus which necessitates one or more pieces of glass, and if, as it is mostly the case, the piece is of a special form, the novice will have trouble to secure it, if he is not able to supply his wants himself.

On account of the extreme hardness of the material it is not the easiest thing to work it successfully, unless the operator is well informed of the subject. Experience and practice is the only way to study glassworking and the unexperienced is often grieved by breaking pieces at the most unexpected places.

It is safe to say that before you will be a practical glass-worker, you will break and spoil a good many pieces, but you will acquire valuable knowledge in return, which in a way often compensates the small loss.

CUTTING GLASS ROD AND TUBING.

This is the easiest part and can be done successfully by almost anybody. If a piece of tubing not larger than ¼" diameter is to be cut in a certain place, simply make a mark with a *sharp cornered* fine steel file. The tubing when tried will break easily at the marked spot and the break will be sharp and clean all around. No rough edges will appear. For larger tubing a file groove must be made all around the circumference of the tube, if a clean break is desired. For tubing larger than 1" diameter, a fairly deep groove must be made, at least 1/64" deep. It is quite important in this instance that the groove shall be very uniform else the edge on the break will get very uneven.

To cut Glass Rod the same rules are observed, only with this difference, that rods from 3/16" diameter upwards require a file mark all around the circumference.

To smoothen the edges of tubing or rod, one may use a fine emery wheel or a fairly smooth fine-grained stone slab. Emery cloth may also be used to good advantage, or even a fine steel file, although it will soon spoil same.

MAKING GLASS JARS

The experimenter often needs small glass jars for some purpose or other and is at a loss to know where to get them, especially if he lives away from supply centres. Most of the time he could supply his own wants right at his home if he only knew.

Nearly everybody has empty bottles of all kinds of shapes standing around which can be easily transformed into good jars.

Take a piece of thick cotton string and soak same well in alcohol. Wind the string, which should be well soaked, around the circumference of bottle at the part which you want to cut and tie a knot so that the string will not slip down.

Now light the string and let the alcohol burn out. Usually just before the flame goes out a sharp click is heard and the bottle in most cases will have been neatly cut in two parts; the lower part giving the jar, the upper part a funnel-shaped piece, which often can be used as a serviceable funnel.

The edges of both jar and funnel must be well smoothened, as explained under "Tubing and Rod," as they are quite sharp and cut the hands badly.

Almost any bottle can be cut in the above manner, but certain heavy glass will sometimes fail to yield. If, after one or two trials, the glass does not seem to give, try again and just as the flame on the string dies dash a few drops of water against the hot part. It will surely break now. However, care must be taken not to use too much water, else the edge will break out very uneven. Quart bottles, with flat bottoms, when well cut, make excellent battery jars at so to say no cost at all.

BENDING GLASS ROD AND TUBING.

For this work a strong alcohol flame, or, better, Bunsen burner, should be used. To bend tubing or rod into an angle, place the piece to be treated between thumb and forefinger of each hand and bring it in the hottest part of the flame. It is absolutely necessary that the glass in all instances is perfectly dry, else cracks are sure to appear. Once in the flame, rod or tube must be turned around its axis quickly, which is easily done by giving the piece a rolling forward and backward motion by means of thumbs and forefingers. The idea of this is to heat the piece evenly all around. As soon as the glass gets red hot and fairly soft, withdraw from flame and bend in whatever shape desired.

We do not recommend glass bending in the flame, because kinks and uneven places occur too often. It is, of course, self-evident that as soon as the glass leaves the flame it should be bent immediately as it only stays soft for a very few seconds,

To make a capillary tube, get the tubing very soft and withdraw from flame. Pull steady and quickly from both sides till the tubing is as thin as desired. Then stop pulling and let cool.

Capillary tubes are made best by means of barometric glass tubing having a bore of about 1/16-3/32" and thick walls.

Tubing of large diameter is bent successfully by filling it first with dry, fine sand. This method does away with kinks.

COLORING BRASS.

The experimenter, if he constructs his own apparatus, finds soon that they look too home-made. Especially the metal arts, if not lacquered or nickeled, will soon look anything but beautiful, and a few suggestions how to give them a nice finish will no doubt be welcomed.

To color brass dead black, which can be varied up to a beautiful light brown, is done as follows:

Dissolve 1 part nitrate of copper in two parts liquid ammonia (specific gravity 0.96). Keep this solution cool. The brass piece to be treated, which must be very clean if success is desired, takes a light hue by dipping in the solution. The longer the piece is left in the fluid, the darker it will get. After 2 or 3 hours it will be dead black. To give the articles a nice bright finish, they should be rubbed well with vaseline, paraffin or beeswax. If the color of the brass piece accidentally got too dark, the color can be shaded lighter by merely treating the piece with muriatic acid. As soon as the right shade is produced, wash the article in water, else spots will appear on the surface of the brass.

LACQUER FOR BRASS, COPPER AND IRON.

For lacquering brass a very clear solution of shellac, dissolved in alcohol, is made, which solution may be filtered through pieces of clean linen till the liquid is clear enough. To this solution add another solution prepared by dissolving Picric acid in alcohol. With little experimenting the right color of the final solution will be ascertained.

For lacquering copper use the clear liquid shellac, to which is added a solution made by dissolving dragon's blood in alcohol. It would be of no use to give the exact proportions at which the various ingredients are to be mixed, as it all depends how light or how dark the lacquer is desired. To get a lighter color add alcohol to solutions. The less alcohol used, the darker the lacquer will be.

It is necessary to heat the piece to be lacquered as hot as the hand can stand it; then apply the lacquer with a wide brush and carry it over the piece with one stroke without stopping.

A fine black lacquer for iron, steel, etc., is obtained by using common black asphaltum paint, thinned down with turpentine to the right consistency. The thinner the paint, the quicker it will dry.

CEMENT TO FASTEN METALS ON RUBBER AND GUTTA PERCHA.

is made by using a solution prepared of 1 part powdered shellac in 10 parts liquid ammonia.

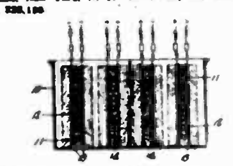
TO TAKE OUT ACID STAINS.

In experimenting with storage batteries it frequently happens that acid is splashed on clothing, tools and woodwork. Sulphuric acid leaves red spots on cloth and destroys same in about two or three days. As soon as you see such a dark red spot on your coat or trousers, do not fail to moisten it at once with strong liquid ammonia. It will disappear as by magic and saves your garments from holes. All acids can be neutralized with liquid ammonia.

A useful invention in your head, is worth ten unuseful ones in the "Patent Gazette."—*"Fips."*

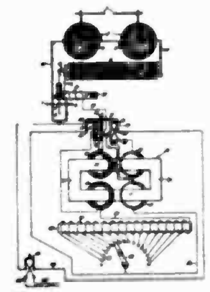
Electrical Patents of the Month

881,[illegible]. ICE-MAKING APPARATUS. Edward T. Williams, New York, N. Y. Filed July 28, 1906. Serial No. 328,[illegible].



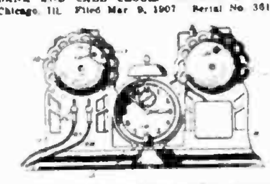
1. In ice making apparatus, a tank, an expansion coil arranged therein, a metal plate arranged at one side of the coil and on which the ice forms during the freezing operation, a source of electrical energy, and means for connecting the plate to the source of energy for the purpose of raising the temperature of the plate and freeing the ice without stopping the flow of the refrigerant through the expansion coil.

880,046. HIGH FREQUENCY DISCHARGE APPARATUS. James E. Seeley, Los Angeles, Cal., assignor to Synchronous Static Company, Los Angeles, Cal., a corporation of California. Filed Nov 26, 1906. Serial No. 345,243.



1. A high frequency discharge apparatus comprising a discharge circuit, a charging circuit, a supply circuit, an induction apparatus having a plurality of windings, means for connecting one of said windings in the supply circuit and the other of said windings in the charging circuit, and means for connecting both of said windings in the charging circuit.

882,320. FLASH-LIGHT ELECTRICAL ALARM AND BANK AND CALL CLOCK. Augusta Y. Jansen, Chicago, Ill. Filed Mar. 9, 1907. Serial No. 361,863.

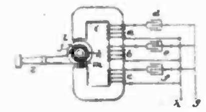


1. A device of the character described comprising a clock provided with an alarm arbor, an electrical bell, a circuit for said bell, means connected with said arbor to interrupt said circuit, means for supplying current to said bell, an electrical lamp, a circuit for said lamp, a circuit parallel with said first mentioned circuit, and a metallic push button switch for closing the circuit of said lamp when pressed and completing the circuit of said bell when pressed against said clock.

880,718. ELECTROTHERMAL GARMENT. Burton R. Charles, Portland, Oreg. Filed Oct. 15, 1907. Serial No. 397,582.

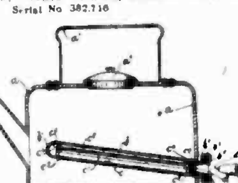
1. A thermal garment provided with a pocket, wires in the garment, the wires passing through the garment into the pocket, a plug on the terminals of the wires to form electric connection, said plug and the wires connecting the same with the garment adapted to be carried in the pocket and concealed.

882,026. MEANS FOR TRANSMITTING ELECTRIC CURRENTS WITH INCREASED ENERGY. Julian A. Stratton, Chicago, Ill. Filed July 13, 1906. Serial No. 326,135.



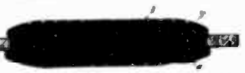
1. The combination with a source of current having diverse frequencies, of a plurality of inductive windings in circuit therewith, a condenser for each of said windings, each condenser and its coöperating winding being proportioned for resonance to a given frequency from said source; separate magnetic circuits each of which is linked by one of said windings and a current reinforcing device controlled by the variable magnetic field established through said magnetic circuits.

881,968. ELECTRIC KETTLE. David C. Bureu, Kalgoorlie, Western Australia, Australia. Filed July 8, 1907. Serial No. 382,716.



In combination with a kettle, a shallow rectangular chamber therein having one end open and extending outside the kettle, said chamber being inclined in relation to the kettle, a frame removably held in said chamber and electric heating coils on said frame.

882,144. STORAGE-BATTERY ELECTRODE. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J., a Corporation of New Jersey. Filed Mar. 30, 1905. Serial No. 252,929.



1. A support for the active material of an alkaline battery, comprising a non-active metallic conducting structure in the form of minute connected irregularly disposed and shaped cells, having filmy or scale-like walls, substantially as and for the purposes set forth.

Electrical Inventions for Which Letters Patent Have Been Granted for the Month Ending March 17th.

879,859. APPARATUS FOR PRODUCING VERY THIN SHEET METAL. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J., a Corporation of New Jersey.

879,879. ELECTROMAGNETIC PIANO-PLAYER. Wesley B. Kraft, Milan, Kans.

879,885. INTERLOCKING RELAY. Edward McClintock, St. Paul, Minn.

879,886. HIGHWAY-CROSSING SIGNAL FOR ELECTRIC ROADS. Edward McClintock, St. Paul, Minn.

879,887. METHOD OF REGULATING ELECTRIC GENERTORS. George S. Neeley, St. Louis, Mo.

879,913. PREPAYMENT ARRANGEMENT FOR METERS. Henry W. Sayles, Peoria, Ill.

879,924. ELECTRICAL APPLIANCE FOR CLOCKS. Harry O. Swedeberg and Amos T. Durbin, Rossville, Ill.

879,927. POLE-SHOE FOR DYNAMO-ELECTRIC MACHINES. Robert B. Treat, Newark, N. J.

879,940. GROUND-CONNECTION CLAMP. William H. Blood, Jr., Wellesley, Mass.

879,943. TROLLEY-POLE SUPPORT. James L. Chase, Ayer, Mass., assignor of one-half to Ralph J. Joslin.

879,949. COIL-RETAINER FOR DYNAMO-ELECTRIC MACHINES. Gano Dunn, East Orange, N. J.

880,011. DYNAMO-ELECTRIC MACHINE. Henry Chitty, Strand, London, England.

880,021. TROLLEY. George H. Gross, Binghamton, N. Y.

880,027. METHOD OF MAKING ELECTRODES. Ernst W. Jungner, Kneipbaden, Sweden.

880,037. METHOD OF TREATING GASES AND GAS MIXTURES BY MEANS OF VOLTAIC ARCS. Albert J. Petersson, Alby, Sweden.

880,055. ARC-LIGHT ELECTRODE CONTAINING METAL WITHIN THE SAME. Hermann Viertel, Charlottenburg, Germany, assignor to Gebruder Siemens, Berlin.

880,074. ELECTRICAL SYSTEM OF MEASURING TEMPERATURES. Ernst Haagn, Hanau, Germany.

880,093. SPEED-LIMITING DEVICE FOR ELECTRICALLY-IGNITED EXPLOSIVE-ENGINES. Frederic S. Perrin, New York, N. Y.

880,107. ELECTRIC TROLLEY. Leonard Smith, North Tonawanda, N. Y.

880,121. ELECTRICAL INSULATOR. Daniel G. Bolton, Camden, N. J.

880,136. SIGNAL SYSTEM. Julien A. Gehrung, New York, N. Y.

880,152. ELECTRIC SIGNAL FOR ELEVATORS. Charles E. Moore, Los Angeles, Cal.

880,155. AUTOMATIC TELEPHONE-ALARM. Milton L. Murdock and John C. Gallagher, Elmira, N. Y.

880,160. BURGLAR-ALARM SYSTEM AND APPARATUS THEREFOR. Milton R. Ney and Samuel S. Ullman, Washington, D. C.

880,167, 880,168. COMBINED LOCK AND ELECTRIC SWITCH. William M. Shannon and George K. Taylor, Columbia, S. C.

880,196. BATTERY. Frank A. Decker, Philadelphia, Pa., assignor, by mesne assignments, to Decker Electric Co., Philadelphia, Pa.

880,203. INSULATOR. John D. E. Duncan, Brooklyn, N. Y. Filed Sept. 9, 1907.

880,209. ELECTRICALLY-OPERATED CLOCK. Harleigh Gillette, Chicago, Ill.

880,218. SIGNAL MECHANISM FOR BLOCK-SIGNAL SYSTEMS. Harry L. Johnson, Topeka, Kans.

880,249. ELECTROMAGNETIC BRAKE. Hiram Snodgrass, Oklahoma, Okla.

880,263. ELECTRIC SIGN. Ignatz Young, San Francisco, Cal.

880,266. ELECTROMAGNETIC CLUTCH. Heinrich Ast, Vienna, Austria-Hungary.

880,294. RIFLE-SIGHT-LIGHTING MEANS. Chester W. Getchell, Waterville, Me.

880,272, 880,273. THERMO-ELECTRICAL SYSTEM. William H. Bristol, New York, N. Y.

880,338. ELECTRIC-ARC FURNACE. Sidney D Spence, Chattanooga, Tenn.

880,329. RAILWAY SIGNALING SYSTEM. Wilmer W. Salmon, Rochester, N. Y.

880,367, 880,368. BATTERY. Frank A. Decker, Philadelphia, Pa., assignor, by mesne assignments, to Decker Electrical Manufacturing Company, Wilmington, Del.

880,398. ELECTROMECHANICAL SLOT FOR SIGNALS. George S. Pflasterer, Nashville, Tenn.

880,418. INSULATOR FOR HIGH-TENSION CONDUCTORS. Samuel H. Summerscales, Winnipeg, Manitoba, Canada.

880,420, 880,421, 880,422, 880,423, 880,424, 880,425. STORAGE-BATTERY PLATE. Alfred O. Tate, Toronto, Ontario, Canada.

880,429. COIL-RETAINER FOR DYNAMO-ELECTRIC MACHINES. Robert B. Treat, Newark, N. J.

880,435. ELECTRIC-ARC LAMP. Thomas E. Adams, Cleveland, Ohio.

880,464. APPARATUS FOR TREATING GASES AND GAS MIXTURES BY MEANS OF VOLTAIC ARCS. Albert J. Petersson, Alby, Sweden.

880,484. PROCESS OF PRODUCING VERY THIN SHEET METAL. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company.

880,485. MAGNETO-ELECTRIC INDUCTOR. Martin Fischer, Zurich, Switzerland, assignor to Actiengesellschaft "Magneta," Zurich, Switzerland.

880,521. FIRE-ALARM. William Glenck, Newark, N. J.

880,544. GROUND-DETECTOR. Justus C. Lawler, Colorado Springs, Colo.

880,537. TELEPHONE DICTATING SYSTEM OR APPARATUS. John W. Kelly, Jr., Camden, N. J.

880,565. FAULT-LOCATING APPARATUS. Lloyd C. Nicholson, Buffalo, N. Y.

880,579. CARBON ELECTRODE FOR ELECTRICAL BLEACHING APPARATUS. Paul Schoop, Nuremberg, Germany.

880,592. LONG-DISTANCE RECORDING-INDICATOR FOR RECIPROCATING DEVICES. Richard H. Sterling, Watsonville, Cal.

880,599. PROCESS FOR ELECTROLYTICALLY PRODUCING PERSULFATES. Gustav Teichner and Paul Askenasy, Nuremberg, Germany.

880,617. ELECTRIC-CIRCUIT CONTROLLER. Christopher Bach, Jr., Milwaukee, Wis.

880,650. SPARKING IGNITER. Paul Gaeth, Cleveland, Ohio.

880,635. TROLLEY-WIRE FINDER. Ferdinand Gundorph, Portland, Oreg.

880,662. AUTOMATIC ELECTRIC FIRE-ALARM SIGNAL. Edward E. Hayden, Washington, D. C.

880,668. BURGLAR-ALARM. William E. Jones, Minneapolis, Minn., assignor to Electric Protection Company, Minneapolis, Minn., a Corporation of Minnesota.

880,675. PROCESS ALARM-CLOCK. William J. Latchford, Chicago, Ill.

880-689. PRIMARY BATTERY. William M. McDougall, East Orange, N. J., and Stanley R. V. Robinson, New York, N. Y.

880,703. BATTERY. George M. Wheeler and Henry Wilhelm, Brooklyn, N. Y.

880,705, 880,706. SYSTEM ON ELECTRICAL DISTRIBUTION. Joseph L. Woodbridge, Philadelphia, Pa.

880,708. TELEPHONE TOLL APPARATUS. Edward P. Baird, Evanston, Ill., assignor to Baird Manufacturing Company, Chicago, Ill., a Corporation.

880,743. ELECTRIC-FURNACE PROCESS. Franz von Kugelgen and George O. Seward, Holcombs Rock, Va.

880,760. PRODUCING METALS BY ELECTROLYSIS. George O. Seward and Franz von Kugelgen, Holcombs Rock, Va., assignors to Virginia Laboratory Company.

880-762. SIGNALING SYSTEM. Bernard Staub, New York, N. Y.

882,508. STATIC-INFLUENCE ELECTRIC MACHINE. Heinrich Wommelsdorf, Charlottenburg, Germany.

880,770. SIGNALING-CIRCUIT FOR RAILWAYS. Joseph A. Wilson, Westfield, N. J., assignor to Hall Signal Company, New York, N. Y., a Corporation of Maine.

880,780. MEANS FOR ELECTRICALLY OPERATING FIRE-ENGINES. Gustave A. Drake, Denver, Colo.

880,788. MEANS OF FORMING ELECTRICALLY-BONDED RAIL-JOINTS. Horatio G. Gillmor, Bath, Me.

880,789. MEANS OF FORMING JOINTS IN ELECTRICAL CONDUCTORS. Horatio G. Gillmor, Bath, Me.

880,838. HIGH-POTENTIAL TRANSFORMER. Chester H. Thordarson, Chicago, Ill.

880,790. IMPLEMENT FOR REMOVING INSULATING COVERING FROM ELECTRIC-CIRCUIT WIRES. John H. Goehst, Chicago, Ill.

880,851. RAILWAY SIGNALING SYSTEM. Joseph A. Wilson, Westfield, N. J., assignor to The Hall Signal Company, New York, N. Y., a Corporation of Maine.

880,854. LIGHTNING-PROTECTOR ATTACHMENT FOR TREES. John P. A. Anderson, Madrid, Iowa.

880,858. ELECTRO-AUTOMATIC WEIGHING APPARATUS. Charles L. Bond, Los Angeles, Cal.

880,888. ELECTROMAGNET. Winthrop K. Howe, Buffalo, N. Y., assignor to General Railway Signal Company, a Corporation of New York.

880,891. ELECTRICAL PURIFICATION OF FLOUR, GRAIN, &c. John L. Lawson, Leith, Edinburgh, Scotland.

880,910. ELECTRIC BELL. Charles J. Wagner, Chicago, Ill.

880,957. STORAGE-BATTERY ELECTRODE. Jonas W. Aylesworth, East Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J., a Corporation of New Jersey.

880,963. TROLLEY-POLE. Henry Bouchard, Austin, Tex.

880,974. INSULATOR. George W. Carter, Canyonville, Oreg.

880,976. TROLLEY MECHANISM. William J. Craig, Pine Bluff, Ark.

880,978, 880,979. ELECTRODE ELEMENT FOR STORAGE BATTERIES. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J., a Corporation of New Jersey.

881,005. SIGNALING SYSTEM. Edward E. Kleinschmidt, New York, N. Y., assignor to George M. Seeley, New York, N. Y.

881,009. MAKE-AND-BREAK IGNITER FOR EXPLOSIVE-ENGINES. Robert H. Koenig, Camden, N. J., assignor, by direct and mesne assignments, to Nicholas A. Petry, Philadelphia, Pa.

881,017. HEATING DEVICE. Wm. E. H. Morse, Algona, Pa.

881,020. WEIGHING-SCALE. Clarence W. McKee, Phoenix, Ariz.

881,049. ART OF LIBERATING ALUMINIUM AND OTHER METALS. Henry S. Blackmore, Mount Vernon, N. Y.

881,055. ELECTRICAL APPLIANCE FOR PROTECTION AGAINST INSECTS. Alphonse L. M. Chaulin, Paris, France.

881,058. GAS-ENGINE IGNITER. Albert N. Classon, Rutland township, Lasalle county, Ill.

881,087. ELECTRIC INSOLE. Robert A. Stevenson and John T. Story, New York, N. Y., assignor of one-half to John T. Story & Co., New York, N. Y., a Firm.

882,198. INDUCTION-COIL. John O. Heinze, Jr., Lowell, Mass.

882,018. INDUCTION-COIL. Melville S. Brigham, Detroit, Mich., assignor of one-half to A. R. Bliss, Lowell, Mass.

881,111. ELECTRIC VIBRATOR. John M. Dinkins, Indianapolis, Ind., assignor to The Hercules Electric Co.

881,109. APPARATUS FOR ELECTROLYSIS OF BRINE. Courtland F. Carrier, Jr., Elmira, N. Y.

881,115. ELECTRICALLY-OPERATED FENDER FOR STREET-RAILWAY CARS. Nathan Fallek, Denver, Colo.

881,138. ELECTRIC BLOCK-SIGNAL. Edward P. Matter, Alexandria, Va.

(Continued on Page 33)

Queries and questions pertaining to the electrical arts addressed to this department will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers. Common questions will be promptly answered by mail.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing, as *all* questions will be answered either by mail or in this department.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

Name and address must always be given in all letters. When writing only one side of question sheet must be used; not more than five questions answered at one time. No attention paid to letters not observing above rules.

If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

ROTARY CONVERTER.—MICROPHONE DETECTOR.

(1.) ERNEST L. NEWKIRK, Independence, Mo., asks: 1. I would like to ask what a rotary transformer is? 2. Is a microphone used in a receiving station and if so, how is it used?

A.—1. A rotary transformer takes alternating current through the contact rings; the latter are connected with three armature spools which are set 120° against each other. The brushes take the direct current from the commutator sectors; alternating and direct-current therefore flow through the same windings of the armature.

A.—2. In receiving wireless messages microphone contact detectors are used sometimes, as, for instance, in the De Forest System. It is used in series, with high resistance (800-1000 ohms) telephone head receivers and one battery.

VOLTAGE AND AMPERAGE OF 4" SPARK COIL.

(2.) JOSEPH M. WALSH, Scranton, Pa., writes:

What is the voltage and amperage of the shock from the secondary coil of a 4" spark coil?

A.—A good deal depends on how much current is used in the primary. High amperage flowing through the primary windings induce a corresponding high amount of voltage and low amperage in the secondary. It is impossible to give exact data, as no two coils of equal size will give exactly the same discharge voltages on the secondary terminals. A 4" spark coil, operated with 6 storage cells of large capacity will give about 200,000 volts in *dry* air. The amperage in this case will be about 0.002.

Your second question is not quite clear to us. What kind of circuit closer have you in mind? For what purpose?

TUNING MAGNETIC DETECTOR.—POLARIZED RELAY.

(3.) C. W. SCHWARZ, Simsbury, Conn., writes:

1. Is a magnetic detector tuned the same way as an electrolytic one? 2. What is the highest practical resistance to wind polarized relays? 3. Do you know of any telephone receivers more sensitive than the 1000 ohm ones?

A.—1. Yes. A.—2. 1000 ohms is the usual resistance, although Marconi has used polarized relays with 10,000 ohms resistance for long distance work. Such instruments respond with the infinitesimal small current of 1/25000 ampere. A.—3. We know of nothing more sensitive than the 1000 ohm receivers.

GENERATOR FOR WIRELESS.

(4.) H. PARKER, Elizabethtown, Ind., writes:

Could a common generator be used in generating current for wireless? If not, solicit other suggestions, as I am an amateur experimenter.

A.—We do not know what kind of generator you have, but same is useless unless you can transform the current of the generator to the high potential, such as is necessary for wireless work. If the machine is of low voltage and low amperage, the best way would be to connect it to a spark coil and use it as you would use a battery, in series with a common telegraph key. If the current is higher than ten volts it must be reduced, else the spark coil might get damaged. If the generator gives alternating current of about 110 volts a high tension transformer could be used, which would do away with the spark coil. Such a transformer will be described in an early issue of "Modern Electrics."

STORAGE BATTERY QUERY.

(5.) CHARLES R. BAKER, Fredonia, N. Y., asks:

1. After storage cells have been charging and a light is run on them, why is it dim at first and after a minute or so comes up to full candle power? 2. Is there any thing that can be put over the top of an open storage cell to keep it from slopping over?

A.—1. You probably have made the grave mistake to charge the cells in the wrong direction. In charging storage cells it is of the utmost importance that the positive (+) pole of storage battery is connected with the positive (+) pole of charging current. If this is not done you will *discharge* the battery and finally reverse the plates which may be put out of commission by such treatment.

In your particular case, most likely the charging current was put on in the wrong direction, which, of course, reduced the voltage of the battery. As soon as the charging (or, rather, discharging) current was taken off the batteries found time to recuperate somewhat, which accounts that the lamp at the start burned dim and afterwards gradually got brighter.

A.—2. Very hot paraffine mixed with a little pitch is poured slowly on top of the acid in the cell. As the melted compound is lighter than the acid it will not sink and after cooling you will find a perfect cover. A hole must be made with a hot iron or other suitable tool to let the gases escape and to fill in the acid in case of evaporation.

WHAT KIND OF CURRENT DOES A SPARK COIL GIVE?

(6.) THOM. A. WALKER, Chicago, Ill., writes:

Please advise if a spark coil gives alternating current or direct current on the secondary? Our teacher claims it is direct, I claim it is alternating.

A.—Your teacher is right. You are wrong. You can easily satisfy yourself that a spark coil gives direct current by trying the following test:

Take a piece of pole test paper and use it on the secondary leads of any spark coil, just as you would use the test paper on a battery. If the coil is operated *one* wire only will print. If the current were alternating, *both* wires would cause the paper to discolor. Usually the negative pole only prints a mark on test paper. Strictly speaking, the current of a spark coil is really pulsating, i. e., it raises from zero to a maximum, stops abruptly and falls to zero, after which it raises anew. This is repeated in extremely quick succession, impossible to follow with the eye. However, with suitable instruments (rotating mirrors), it can be proven that the continuous stream of sparks in a spark gap is in reality nothing but a series of small sparks following each other in very quick succession.

BURNT OUT LAMP BURNS AGAIN.

(7.) H. B. HENSLEY, Buffalo, N. Y., writes: A very strange thing happened yesterday, and I can't understand how it was done; therefore I thought I would write you, as I know you are authority on the subject.

I have an 8 volt Tantalum bulb, which I burn on a 4 cell storage cell as a reading lamp in the evening. Last night it went suddenly out and, thinking the fault was in the battery or wiring, I looked over everything carefully. However, at last, I found that the bulb was burnt out and I could distinctly see the break in the loop, of which I am positive. Of course, the lamp had to be thrown away and to that effect I threw it in the waste basket.

However, my brother found it in my absence and thought it had fallen down by accident and replaced it in the socket. When I came back the lamp was burning better than ever and you can understand how amazed I was, as I only have one bulb and I could swear to it that I saw the break in the filament in the centre of the loop. What wonder happened?

A.—No wonder at all. A common occurrency. Nearly everybody is used to throw away a *carbon* type bulb, as it is well known that a break in a carbon filament can not be repaired. A tantalum lamp is different in that respect, because the filament welds itself as soon as the broken portions of the filament touch each other and the current is flowing. In your case, the throwing down of the bulb in the waste basket was a sufficient shock to bring the broken parts in contact and the current welded the filament automatically. This is one of the advantages of a tantalum lamp and breaks sometimes weld automatically 6 to 8 times before the lamp is put out of commission entirely. When your lamp burns out next time, shake it hard till you make it burn again. 110 volt tantalum lamps, on account of their peculiar construction, weld the broken filament entirely automatically, without shaking, from 8 to 12 times before final destruction of the filament.

LIFE OF TANTALUM LAMP.

(8.) C. F. LEVY, Clinton, Mo., writes:

1—In connecting up my one inch coil on four dry cells I can only get ¼ of an inch spark, and would like to know what is wrong with same?

2—What is the size of primary wire on a 1 inch coil?

3—Is there any reason why three gravity batteries in series would not charge three storage cells in parallel?

4—What is the usual life of a new Tantalum lamp?

A 1.—Your batteries were probably run down, and we suggest to get a new set.

A 2.—Usually double cotton covered, well paraffined, magnet wire No. 16 is used.

A 3.—There is no reason whatsoever, as three gravity cells will give you about three volts, while three storage batteries in parallel will only give 2.5 volts when *fully charged*. The plan is feasible, but it will take rather long to charge the storage batteries, especially as the amperage of the primary batteries is rather low. If we were you we would connect eight gravity cells in series multiple, which would make the charging process somewhat quicker.

A 4.—The life of this lamp is hardly ever guaranteed by the makers, as the filament breaks too easy under the influence of shocks and transportation. If the lamps are handled carefully, most of them will last from 100 to 500 hours, and some lamps even burn considerably longer than this.

DYNAMO AND STORAGE BATTERIES FOR WIRELESS.

(9.) ARTHUR BLAKE, Philadelphia, Pa., asks: In a certain article on the construction of a hundred-mile wireless telegraph set it is stated that a battery of thirty-five Edison batteries should be used.

1—What kind of a dynamo would be required to replace the batteries? What voltage, amperage and number of watts?

2—How many storage batteries would be required in connection with this dynamo?

A 1.—Edison batteries give an average of .9 of a volt when new. This would figure out to about thirty volts and a half. The right amperage would be about twenty, which would give you a regular five hundred watt, or as usually called one-half K. W. machine.

A 2.—You would need about fifteen storage batteries of a capacity not less than 80 ampere hours, which could be discharged at a four hour rate.

WHY DID THE FUSE BLOW?

(10.) HARRY KERKOW, Austin, Minn., asks: In connecting up a small toy motor in series with a small rheostat and a 110-6 C. P. light the motor will not work. If I cut out the lamp and put in a little resistance it would run the motor for 2 or 3 minutes, until it blew out the two ampere fuses. Why did it blow the fuse out after a few minutes and why did it not blow at the start?

A.—The resistance which you inserted instead of the lamp was not quite high enough. It was just enough to keep the fuse from blowing out immediately, but as soon as you started the motor the fuse wire became hot but the current was not sufficient to melt it at once. When your motor was run for a few minutes the fuse wire got too hot and consequently melted. Also it might have been that you are in a building or in the neighborhood where much current is used and you started your motor just when the load was on full. As soon as the load decreased from some reason or other, the current raised and was now sufficient to burn out your fuse. This is of a common occurrency.

WIRE FOR 20 OHM MAGNETS.

(11.) JOHN LAPE, Watervliet, N. Y., asks: Please give size and length of magnet wire it will take to make electromagnets for 20 ohm sounder or relay?

A.—One hundred and twenty-eight foot No. 28 single cotton covered magnet wire is required.

CAN'T STOP WORKING OF COHERER.

(12.) James E. Fahn, New Hamburg, Ont., writes: I have a coherer and decoherer in connection with a 150 Ohm relay and 5 Ohm sounder. Somehow or other the sounder and decoherer will operate and keep on giving dots and dashes for an indefinite time. I have tried to remedy it by tightening the relay spring, but it seems to do nd good. If I tap the glass tube sharply with a pencil it will stop. What is the trouble?

A.—Your tapper does not tap strong enough against the glass tube. You should have less tension on the tapper or either more battery current. It might be possible also that you have too much sparking on the decoherer and relay contacts, thereby creating oscillations. We refer you to the article in this issue, "How to Remedy Troubles in Wireless Instruments." This will give you all the necessary information.

LIGHTING GEISSLER TUBES.

(13.) Fred C. Cheney, St. Louis, Mo., asks:

1—I have a one inch spark coil and would like to find out how many Geissler tubes I can run on same? I would wish to use 6" tubes.

2—Please explain action of polarized relay?

A 1.—If your coil gives a fat one inch spark you can light up about ten 6" Geissler tubes easily. They must be all connected in *series*, not in parallel. The more tubes you add the less light they will give. Ten tubes usually would be found to work well under ordinary circumstances with fairly strong battery.

A 2.—The philosophy of the polarized relay is as follows: A very strong, permanent magnet has mounted on *one* pole the two spools. It is evident that the polarity on each leg will be the same (both being mounted on the same pole). A finely balanced armature is hung between the two bobbin legs, which never touches the poles. By means of the set screws the armature is set so that it is exactly in the center between the two poles. The relay is now balanced. A minute current passing through the spools will disturb the balance and consequently move the armature, which in turn, making connection with the contact stop, closes the circuit.

EXPERIMENTS IN STATIC ELECTRICITY.

(Continued from page 14.)

peculiar, as the hand holding the glass part takes the place of the outer coating; strictly speaking, there is no inner coating, except the carbon deposit in the inside of bulb. It is also found that if the vacuum of the lamp is destroyed the Leyden jar effect is destroyed. It is evident that a good idea for further experiments can be found here.

Lamps of different sizes have been tested out to find their capacity and it has been found that a 1 C. P. lamp is able to accumulate a ½"spark; 16 C. P., 1"; 50 C. P., 1¼"; 100 C. P., 1½". The 100 C. P. gives a very powerful shock.

LICENSE FOR WIRELESS.

Hale's Bill Also Puts Service Under Control of the Government.

Washington.—A bill was introduced recently by Senator Hale requiring a Federal license for foreign and inter-State communication by wireless telegraphy, which is to be put completely under the jurisdiction of the Government and can be abolished by the President in times of war.

The Hale bill would impose a license on commercial land stations of $100 a year and a license of $5 a vessel on all equipped with wireless apparatus. Violations of the rules would not only mean a heavy fine, but would mean also that the Government could appropriate the apparatus of the company or vessel that had violated the statute.

The most severe penalty is provided for interference with messages sent or intended for the Government, or the malicious use or operation of wireless instruments under license by the Government.

Another feature of the bill is the provision that makes it compulsory for all licensed wireless operators to act as relays for messages received by them. The act makes it the duty of every person or corporation using or operating wireless under a license issued by the United States to answer wireless calls and signals from any other person or corporation so licensed.

The act is to be in effect July 1, 1908, provided it passes Congress.

ELECTRICAL PATENTS

(Continued from page 26.)

881,247. ELECTRIC PUMP-REGULATOR. Andrew Koesche, Chicago, Ill.

881,264. ELECTRIC SIGNAL DEVICE. Elias Schermerhorn, Amsterdam, N. Y., assignor of one-half to William P. McKeough, Amsterdam, N. Y.

881,272. AUTOMATIC DRAFT-REGULATOR. Henry J. Westover, New York, N. Y.

881,284. WALL-BRACKET FOR ELECTRIC LIGHTS. William R. Atkinson, New York, N. Y.

881,297. SOCKET FOR ELECTRIC LAMPS. Charles G. Burton, Peru, Ind.

881,300. ELECTRIC SWITCH. Everett M. Coffin, Oakland, Cal.

881,306. ELECTRIC SWITCH. George Cutter, South Bend, Ind.

881,344. ELECTRIC SIGN-RECEPTACLE. Frank J. Russell, New York, N. Y.

881,360. TELEPHONE-RELAY. Charles W. Underwood, Crowley, La.

881,371. ELECTRICAL PLUG AND RECEPTACLE. Pennell C. Brown, Boston, Mass., assignor of one-half to Frank L. Russell, New York, N. Y.

881,390. ILLUMINATED SIGN. James W. Ellis, Denver, Colo., assignor of one-half to Andrew P. Thompson, Denver, Colo.

881,404. ELECTRIC ESCAPMENT FOR TIME-MOVEMENTS. Charles F. Hollister, Waterbury, Conn.

881,456. DYNAMO-ELECTRIC MACHINE. Henry Berg, Orange, N. J.

881,460. MAGNETO FOR SPARKING MECHANISMS. Harold H. Brown, Boston, Mass.

881-470. TROLLEY. Charles Harkness, Providence, R. I., assignor, by mesne assignments, to The United Traction Improvement Company, a Corporation of Rhode Island.

881,479. CHRONOGRAPH. Ezra B. Merriam, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

881,503. AUTOMATIC STREET-INDICATOR. Thos. Tighe and Charles S. Cross, New York, N. Y.

881,517, 881,518. ELECTRIC FURNACE. Charles E. Wilson, Ferris, W. Va.

881,519. ELECTRODE-HOLDER FOR ELECTRIC SMELTING-FURNACES. Charles E. Wilson, Ferris, W. Va.

881,520. SECTIONAL ELECTRODE FOR ELECTRIC FURNACES. Charles E. Wilson, Ferris, W. Va.

881,531. CURRENT-COLLECTOR FOR THE THIRD RAIL OF ELECTRIC RAILWAYS. John G. Baukat, White Plains, N. Y.

881,579. ELECTRIC BELL. Donald M. Bliss, New York, N. Y.

881,565. SAFETY-LIMIT SWITCH. Henry A. Everett, Barrington, N. J., and Arthur Parker, Philadelphia, Pa.

881,580. METHOD OF RECOVERING COPPER FROM ORE OR MATTE BY ELECTROLYSIS. Henry K. Hess, Philadelphia, Pa.

881,587. TROLLEY-WHEEL-PLACING DEVICE. Hubert G. Husted, Oberlin, Ohio.

881,588. METHOD OF EXHAUSTING VAPOR CONDUCTORS. Alexander M. Jackson, Schenectady, N. Y.

881,596. ELECTRIC CARRIER. Sam H. Libby, East Orange, N. J., assignor to Sprague Electric Company, a Corporation of New Jersey.

881,599. MEANS FOR TRANSMITTING POWER FROM THE AXLES OF RAILWAY-CARS. Lawrence C. Maher, Philadelphia, Pa.

881,628. TELEPHONE CUT-OUT. Edwin W. Smith, New York, N. Y.

881,635. CAB SIGNAL SYSTEM. David P. Thomson, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

881,636. BALANCER SET. Louis E. Underwood and Richard W. Douglas, Lynn, Mass., assignors to General Electric Co.

881,642. ELECTRIC RELAY. Edward Weston, Newark, N. J.

881,647. SELF-EXCITED ALTERNATOR. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

881,663. FIRE-ALARM. George H. Carroll, Vacaville, Cal.

881,683. ELECTRICAL SOCKET-SEAL. Llewellyn T. Hatfield, Sacramento, Cal.

881,684. SPARK-PLUG. William B. Hayden, New York, N. Y. Filed June 7, 1907.

881,686. ELECTRIC SWITCH. Sylvester Hoadley, Gosport, Ind.

881,712. ELECTRIC-LIGHT SUPPORT. Philip N. Thevenet, Dallas, Tex.

881,743, 881,744. DYNAMO SUSPENSION. William I. Thomson, Newark, N. J. assignor to The Saftey Car Heating Co.

881,765. STARTING DEVICE FOR MERCURY-VAPOR ELECTRIC LAMPS. Louis A. Audibert, Lodeve, France.

881,777. TERMINAL FOR ELECTRIC CABLES. Charles W. Davis, Edgeworth, Pa., assignor to Standard Underground Cable Company, Pittsburg, Pa., a Corporation of Pennsylvania.

881,810, 881,811. ELECTROPLATING APPARATUS. George A. Lutz, New York, N. Y., assignor to American Circular Loom Company, Portland, Me., a Corporation of Maine.

881,847. THERMOSTAT. Fred. P. Butman, Holbrook, Mass.

881,862. ELECTRIC IGNITION APPARATUS. Russell Huff, Detroit, Mich., assignor to Packard Motor Car Co.

881,864. MEANS FOR TRANSMITTING POWER ELECTRICALLY. Gregor Lewin, Schoenberg, near Berlin, Germany, assignor to Siemens—Schuckert-Werke, Berlin.

881,878. TELEPHONE-SWITCH. Andy N. Wright, Jackson Center, Ohio, assignor of one-third to Harney L. Hill, Jackson Center, Ohio.

881,880. GALVANOMETER. Sidney G. Brown, London, England.

881,934. PROCESS OF PRODUCING ALUMINUM-MAGNESIUM ALLOYS. Franz Von Kugelgen and George O. Seward, Holcombs Rock, Va., assignors to Virginia Laboratory Company, New York, N. Y., a Corporation of New York.

881,938. BLOCK-SIGNAL. Done D. Miles, Jr., Aurora, Ill.

881,943. ELECTRIC-LIGHT SIGN. Mortimer Norden, New York, N. Y., assignor to The Electric Carriage Call Company, New York, N. Y., a Corporation of New York.

881,952, 881,953. IGNITING DEVICE FOR GAS-ENGINES. John V. Rice, Jr., Bordentown, N. J.

881,954. IGNITING DEVICE FOR GAS-ENGINES. John V. Rice, Jr., Bordentown, N. J.

881,967. ELECTRIC INSULATOR. Charles R. Slusser, Montpelier, Idaho.

881,963. DISTRIBUTION-FIXTURE. William D. Scott, Buffalo, N. Y.

881,965. FUSE AND FUSE-BOX. Frank L. Sessions, Columbus, Ohio, assignor, by mesne assignments, to The Jeffrey Manufacturing Company, a Corporation of Ohio.

881,985. PLUG-SEAT SWITH. Bernard O. Wells, Charleston, Ill., assignor to Sterling Electric Company, La Fayette, Ind.

882,003. ELECTRICAL IGNITING APPARATUS. Edward S. Huff, Detroit, Mich., assignor to Henry Ford, Detroit, Mich.

882,013. ELECTRIC SIGN OR ILLUMINATING DEVICE. William N. McComb, New York, N. Y.

882,055. GAS-LIGHTING DEVICE. William K. Elliott, Payson, Ill.

882,089. ELECTRICAL SIGNALING APPARATUS. Benjamin F. Wooding, Denver, Colo.

882,096. LIGHTNING-ARRESTER. Franklin P. Cauble, Lincolnton, N. C.

882,143. BLOCK-SIGNAL SYSTEM. William Daves, Bloomington, Ill., assignor to The Inter-State Signal Company, Camden, N. J., a Corporation of New Jersey.

882,110. ANODE. Albert M. Hill, New Haven, Conn., assignor to C. Upham Ely, Brooklyn, N. Y.

882,118. ANNUNCIATOR. John T. Needham, Bayonne, N. J., assignor of one-half to Postal Telegraph-Cable Company, New York, N. Y., a Corporation of New York.

882,153. TROLLEY-HEAD. James Lennox, Brackenridge, Pa.

882,157. SAFETY APPLIANCE FOR RAILWAY-TRAINS. Robley C. Millard, Atlanta, Ga.

882,158. MAGNETIC ORE-SEPARATOR. Richard R. Moffatt, New York, N. Y., assignor to Imperial Ore Separator Company, a Corporation of New York.

882,169. ELECTRODE. Marcus Ruthenburg, Philadelphia, Pa.

882,186. SECONDARY ELECTRIC CLOCK. George B. Bowell, Westminster, London, England.

882,218. ELECTRIC-DISCHARGE APPARATUS. Percy H. Thomas, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, a Corporation of Pennsylvania.

882,225. FLUSH-RECEPTACLE. Frank T. Wheeler, Plainville, Conn., assignor to Trumbull Electric Manufacturing Company, Plainville, Conn., a Corporation of Connecticut.

882,242. CROSS CONNECTION FOR DYNAMO-ELECTRIC MACHINES. William H. Foot, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, a Corporation of Pennsylvania.

882,250. FIRE-ALARM BOX. Maynard W. Hamblin, Milwaukee, Wis., assignor to American District Telegraph Company, New York, N. Y., a Corporation of New Jersey.

882,257, 882,258. INCANDESCENT LAMP. Matthew M. Merritt, Middleton, Mass., assignor to National Electric Lamp Company, Cleveland, Ohio, a Corporation of New Jersey.

882,260. SPARK-PLUG CLIP. Charles A. Mezger, New York, N. Y., assignor to C. A. Mezger, Inc., New York, N. Y., a Corporation of New York.

882,265. LIGHTNING-ARRESTER. Newitt J. Neall, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, a Corporation of Pennsylvania.

882,275, 882,276. RAILWAY SIGNALING APPARATUS. John D. Taylor, Edgewood Park, Pa., assignor to The Union Switch & Signal Company, Swissvale, Pa., a Corporation of Pennsylvania.

882,327, 882,328, 882,329. CIRCUIT-CONTROLLING DEVICE FOR TELEGRAPHONES. John A. Lieb, New York, N. Y., assignor to American Telegraphone Company, a Corporation of the District of Columbia.

882,337. JUNCTION-BOX FOR ELECTRICAL CONDUITS. Adnah McMurtrie, New York, N. Y., assignor to Thomas and Betts, New York, N. Y., a Corporation of New York.

882,310. ELECTRICALLY-CONTROLLED SWITCH MECHANISM. Granville E. Palmer, Boston, Mass., assignor of one-fourth to Charles B. Price and one-fourth to Frank S. Price, Salem, Mass.

882,347. COMPOSITE SIGNALING AND TELEPHONE SYSTEM. Harry O. Rugh, Sandwich, Ill.

882,385. MACHINE FOR THE MANUFACTURE OF COILED SPRINGS. Noah S. Harter, Waukegan, Ill., assignor to American Steel & Wire Company, Chicago, Ill., a Corporation of New Jersey.

882,394. CONTACT APPARATUS FOR ELECTRIC IGNITERS. John Krannichfeldt, Cologne, Germany.

882,424. INSULATOR-PIN. William Scharfhausen, Payette, Idaho, assignor to Payette Insulator Pin Company, Limited, Payette, Idaho.

882,388. ELECTRIC OIL-SWITCH. John D. Hilliard, Jr., and Charles E. Parsons, Glens Falls, N. Y.

882,450. TROLLEY. Frank E. Brazeal, Monson, Mass., assignor of one-half to Herman S. Mowry, North Adams, Mass.

882,509, 882,510. APPARATUS FOR PRODUCING OZONE. Albert C. Wood, Philadelphia, Pa.

882,514. CONNECTION FOR ELECTRIC CONDUCTORS. Frederick O. Ball, Plainfield, N. J., assignor of one-half to F. H. Ball, Plainfield, N. J.

882,531. ROTARY CONVERTER. John L. Murdock, Boundbrook, N. J.

882,523. BLOCK-SIGNAL SYSTEM. Frank E. Kinsman, Plainfield, N. J.

The publishers will send copy of any of the foregoing patents on receipt of 15 cents.